



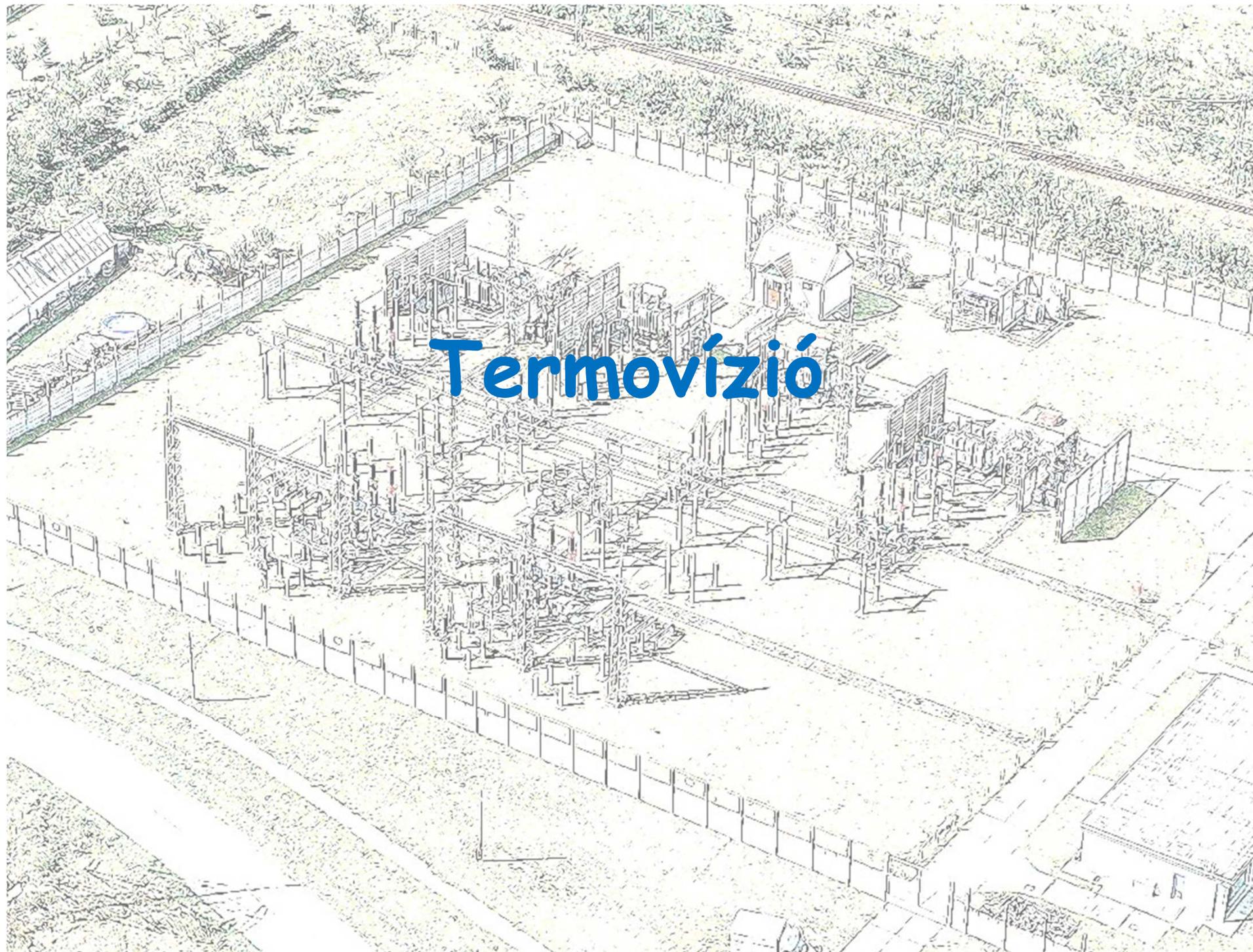
Szigetelésdiagnosztikai konferencia
Sümege 2016.

ELMŰ-ÉMÁSZ Hálózati kft.
Szakszolgálatok osztály

Alállomási diagnosztika. Mérések. Hibák. Érdekeségek.

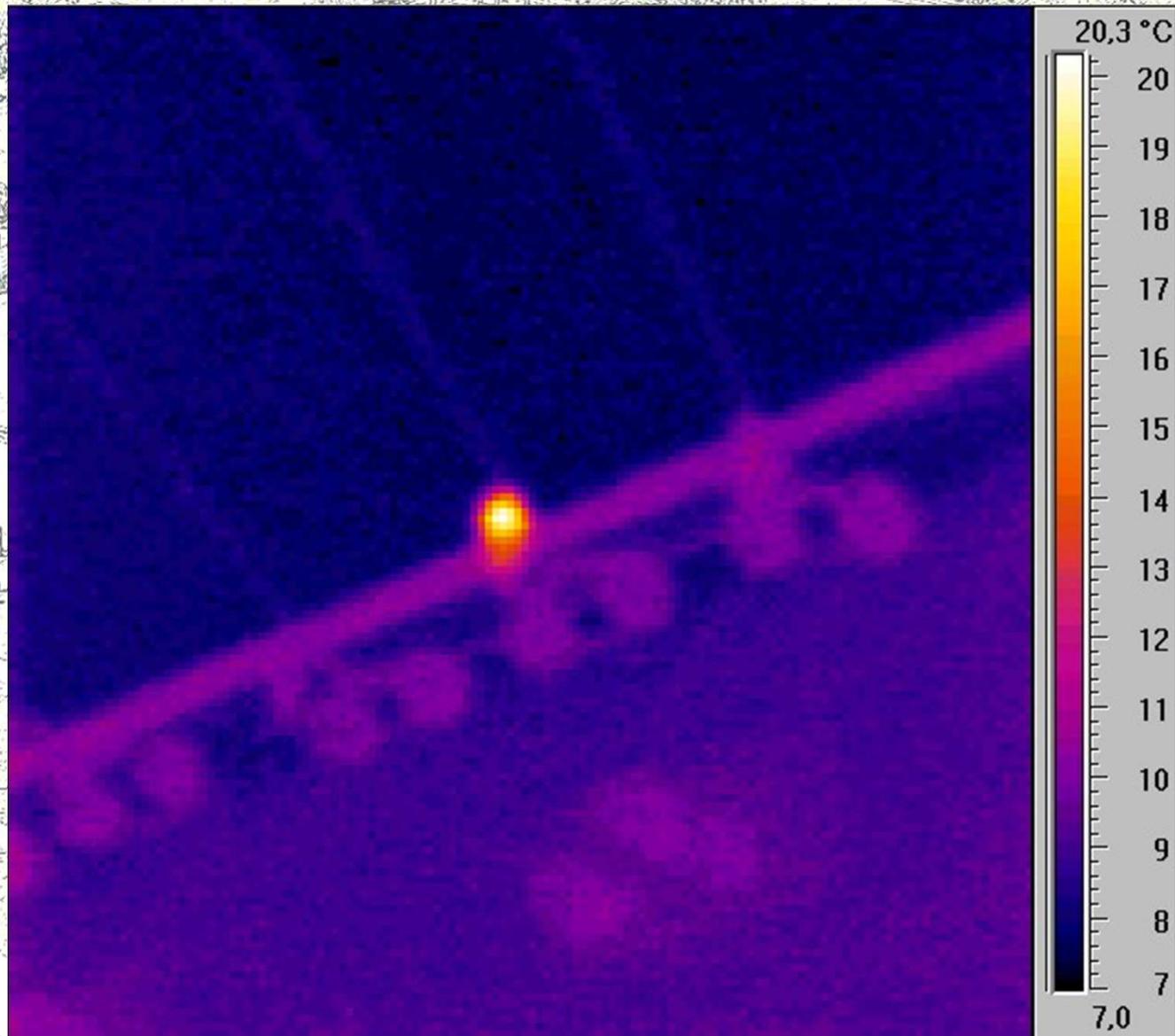
Deutsch György - gyorgy.deutsch@elmu.hu
Huber Ferenc - ferenc.huber@elmu.hu

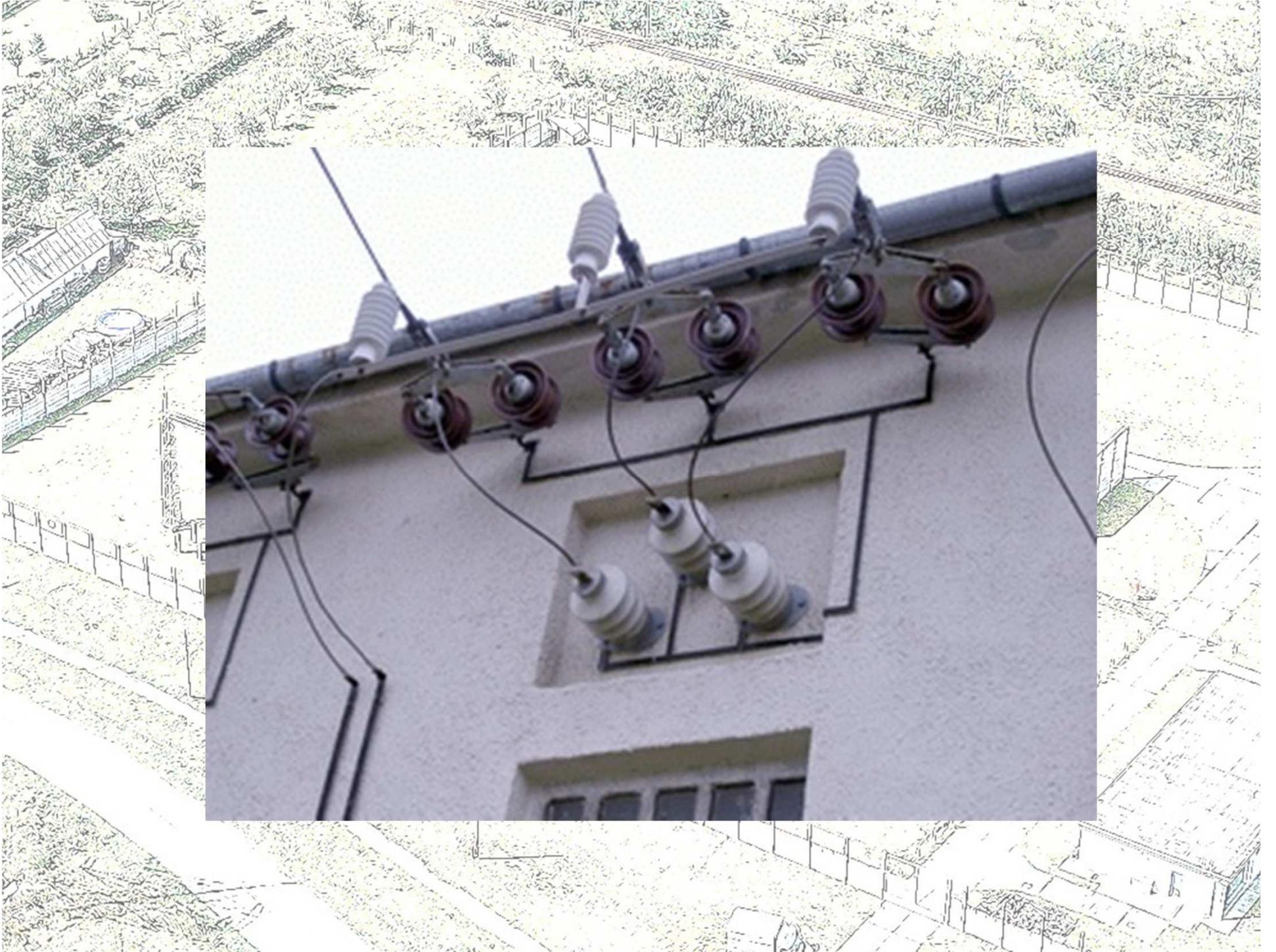
ELMŰ - ÉMÁSZ TÁRSASÁGCSOPORT



Termovízió

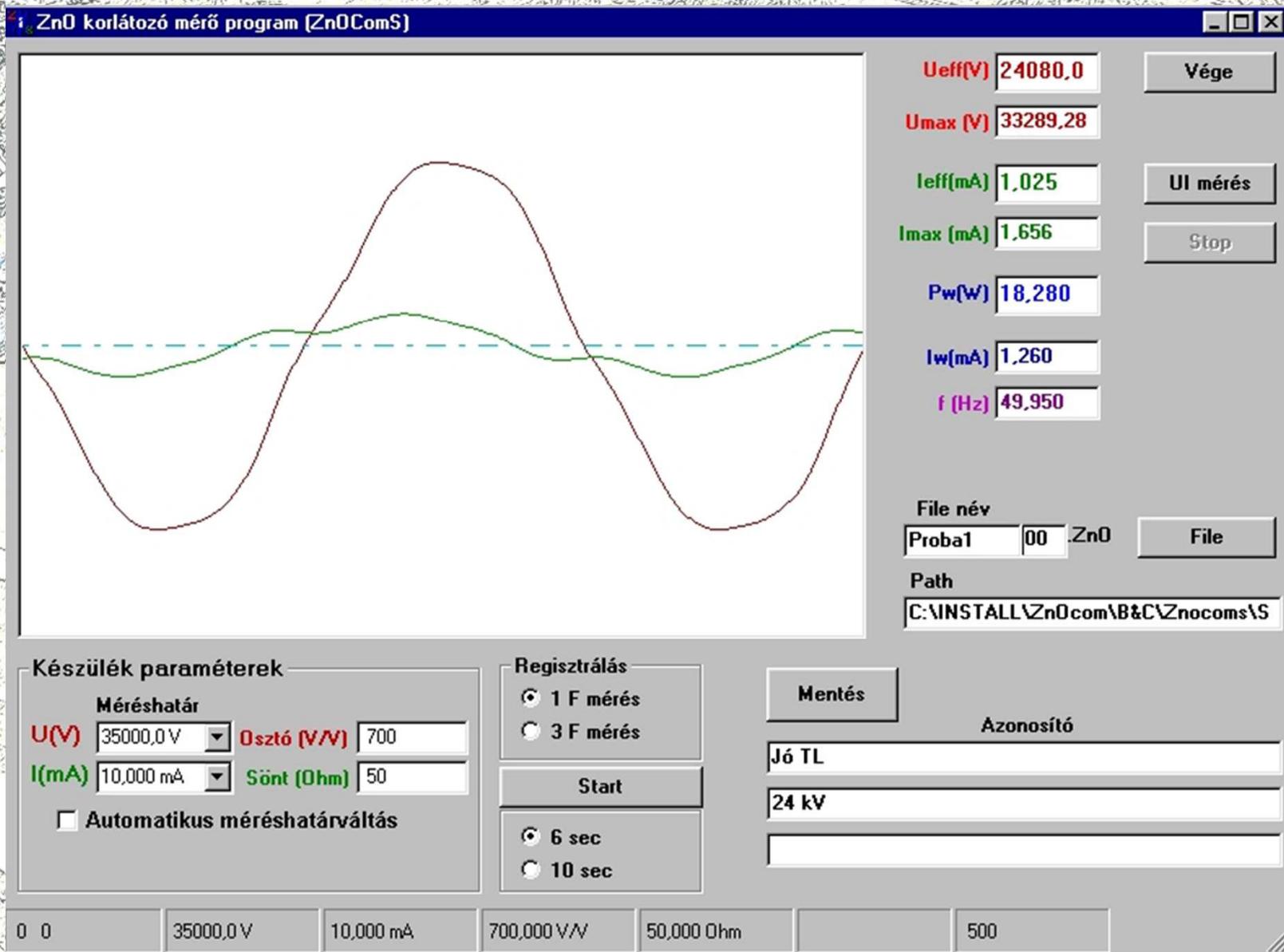
Meghibásodott 20 kV-os ZnO túlfeszültség-levetető



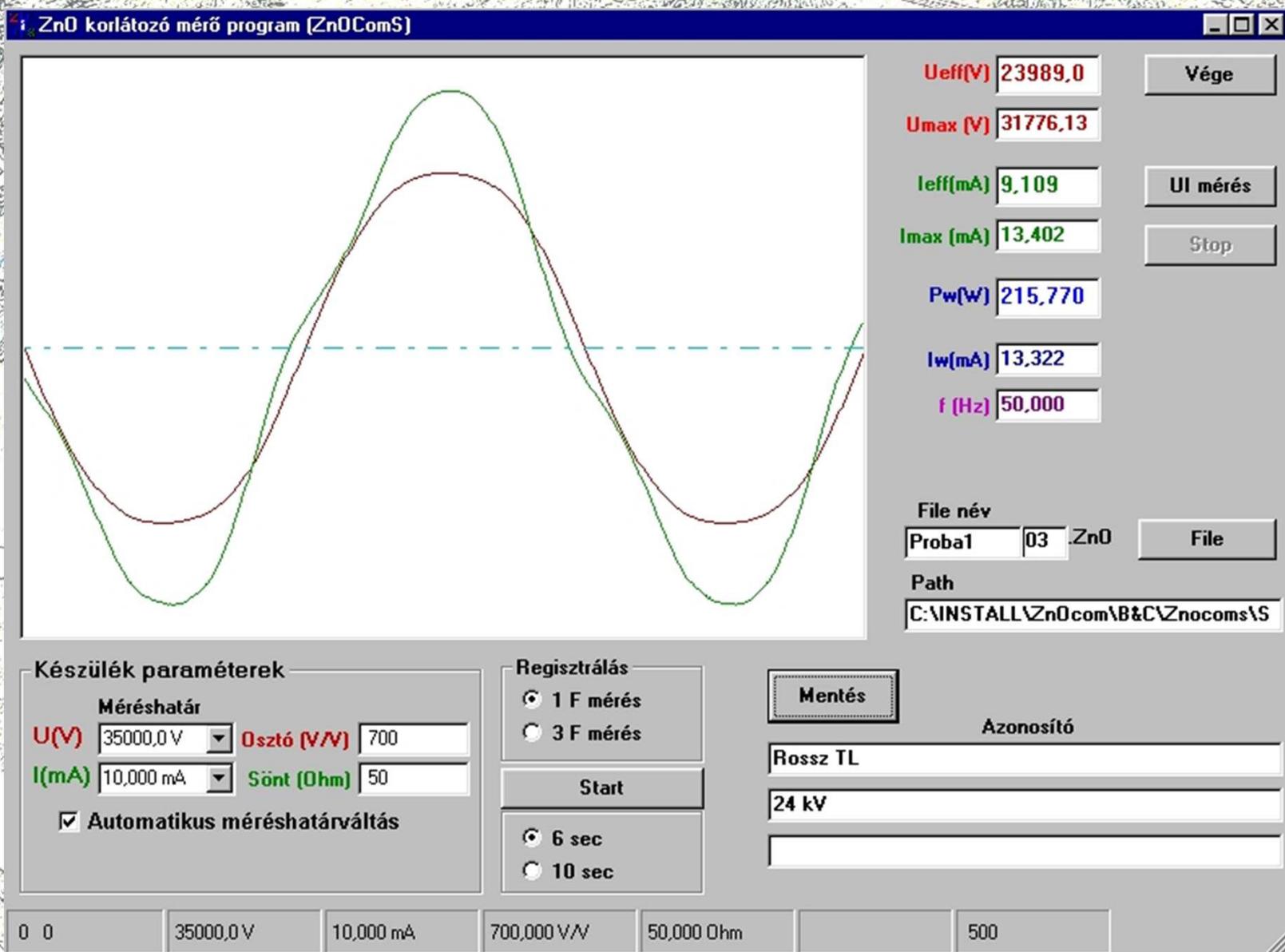




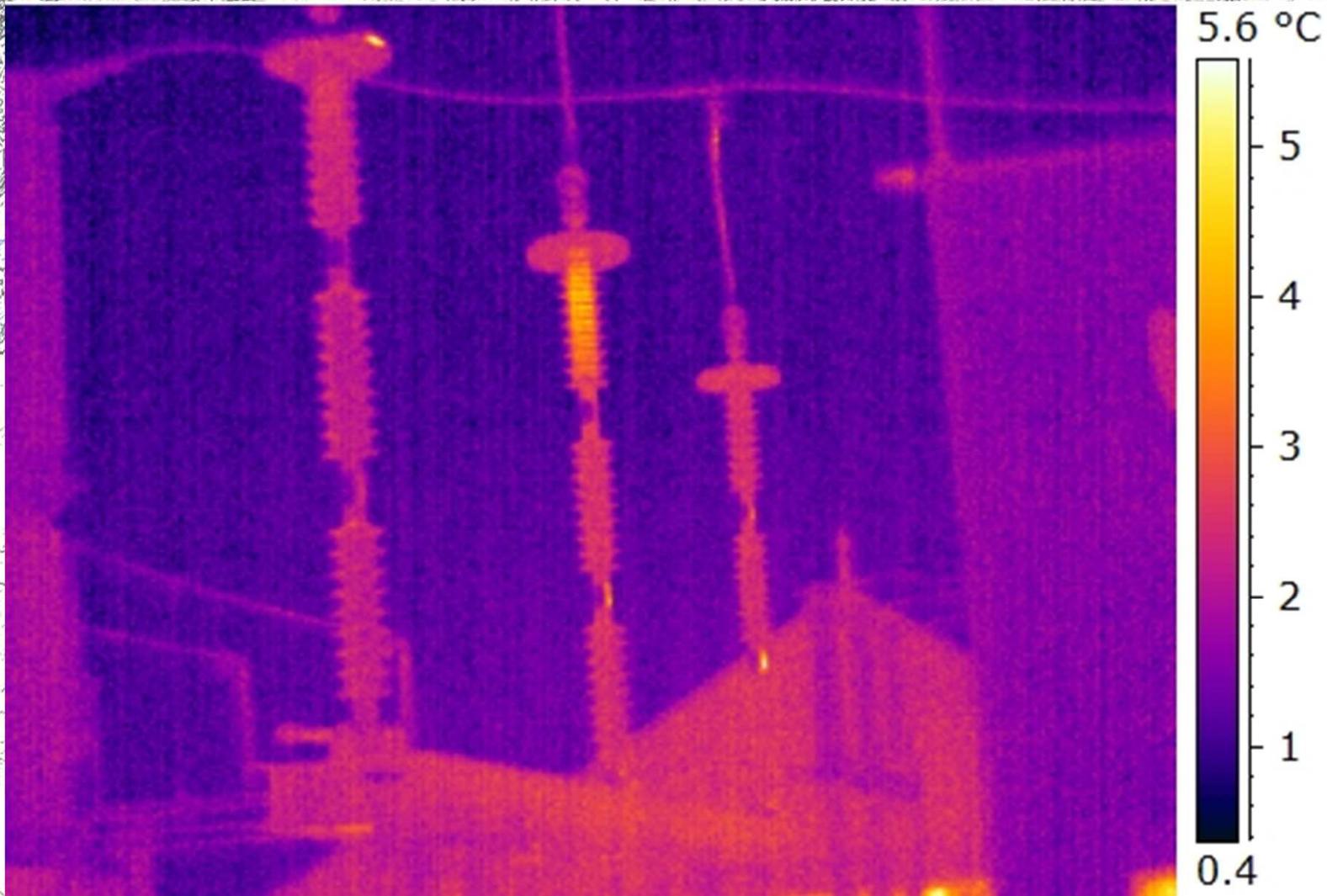
Jó TL áramalakja



A meghibásodott TL áramalakja



Meghibásodott 120 kV-os ZnO túlfeszültség-levetető





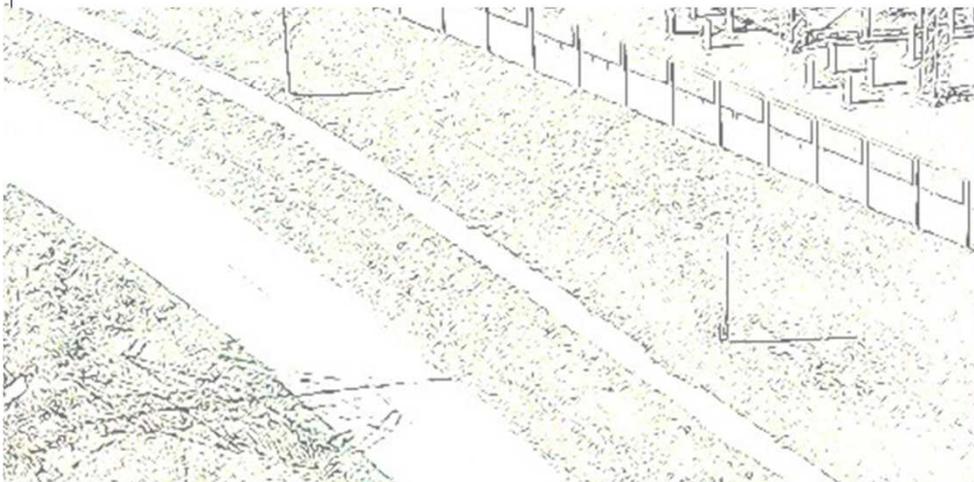
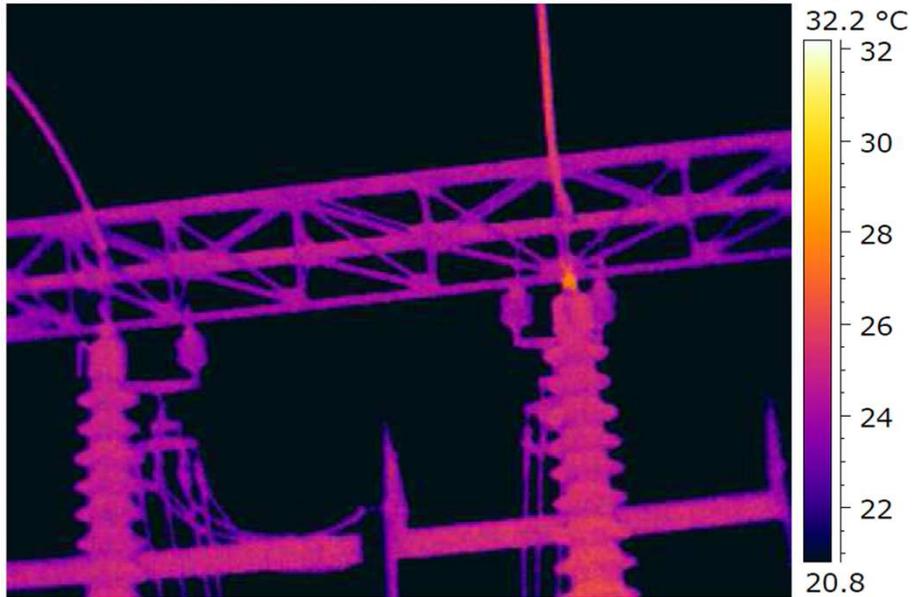
Mérési adatok

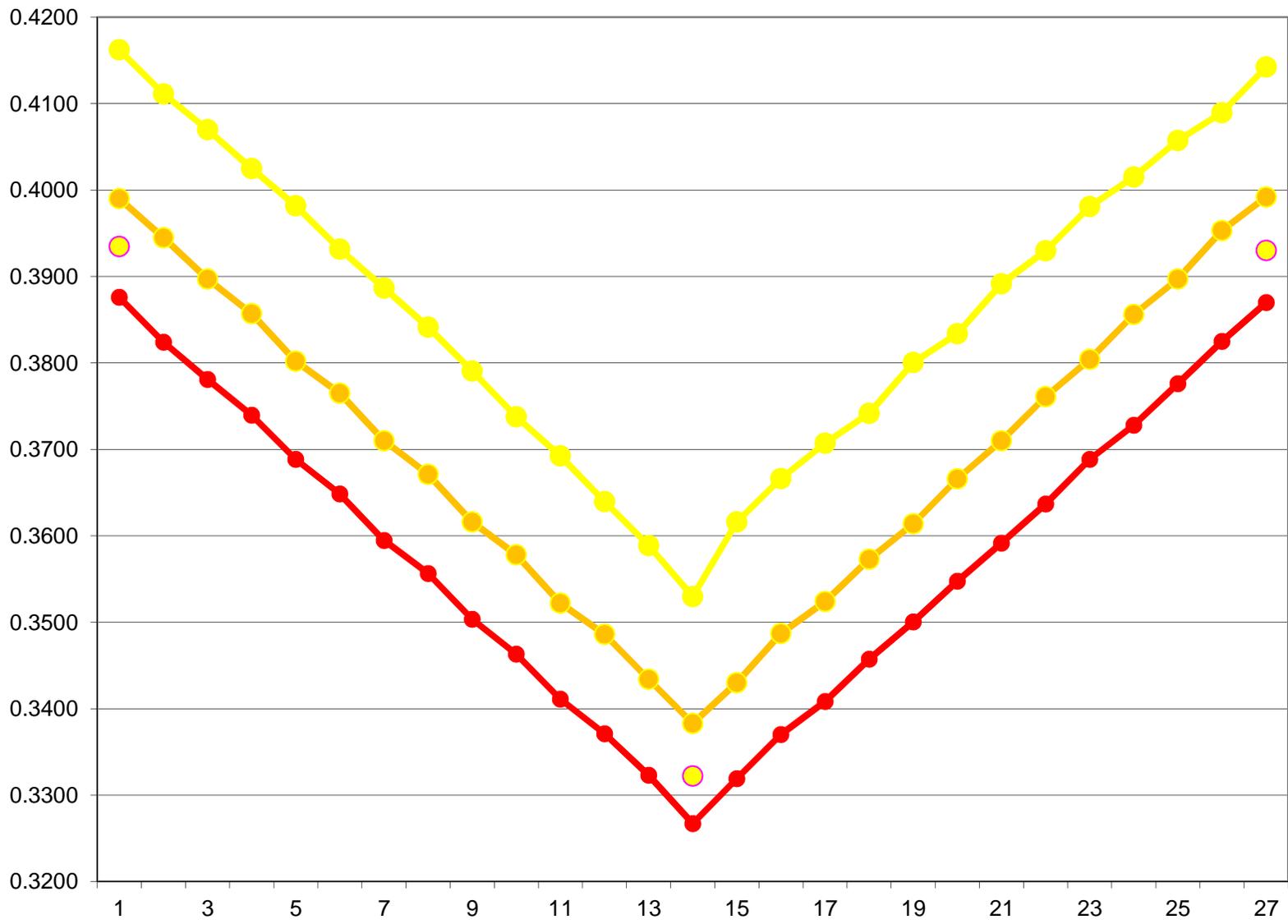
kV	alsó	középső	felső	
5	0.054	0.051	0.109	mA
10	0.109	0.103	0.221	mA
15	0.164	0.157	0.347	mA
20	0.216	0.211	0.718	mA
25	0.272	0.273	-	mA
30	0.346	0.305	-	mA
35	0.523	0.590	-	mA
36	0.640	0.740	-	mA

kV	alsó	középső	felső	
5	0.270	0.255	0.545	VA
10	1.090	1.030	2.210	VA
15	2.460	2.355	5.205	VA
20	4.320	4.220	14.360	VA
25	6.800	6.825	-	VA
30	10.380	9.150	-	VA
35	18.305	20.650	-	VA
36	23.040	26.640	-	VA

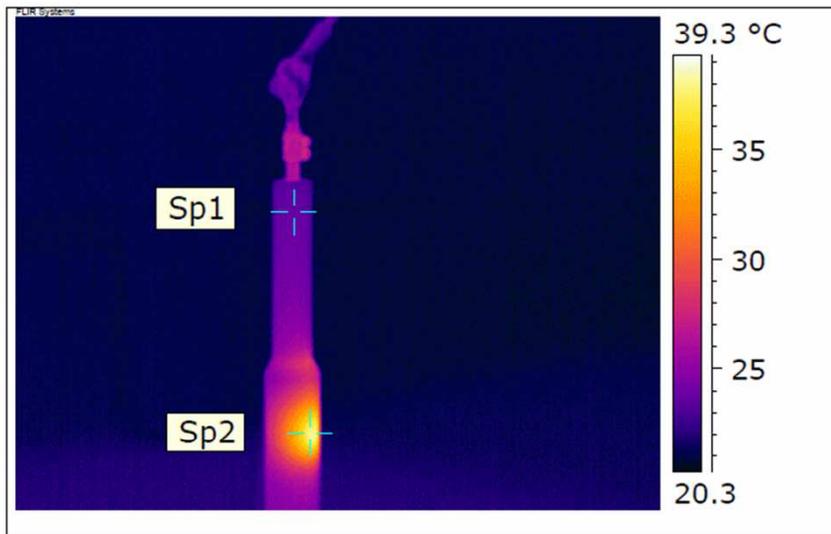
120/10 kV-os tr. „S” fázis (hiba az átvezető szigetelőlónél)

„P” fázis 25 °C - „S” fázis 27,7 °C

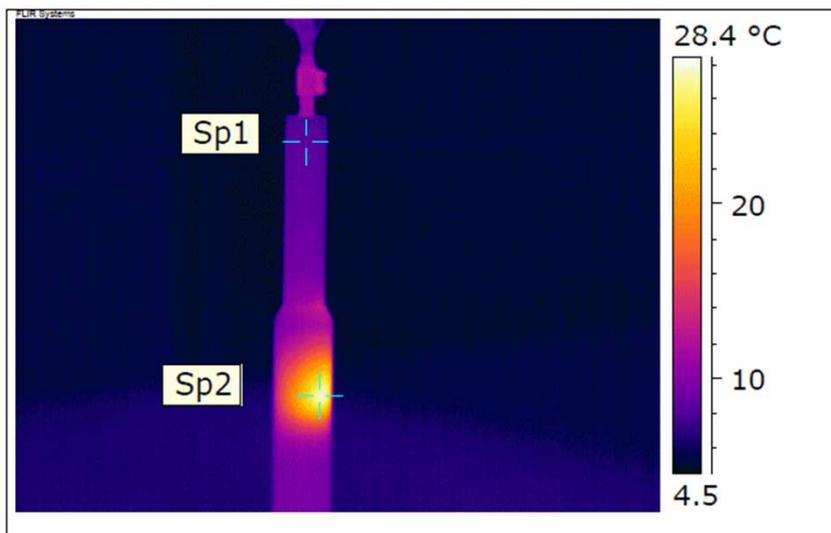




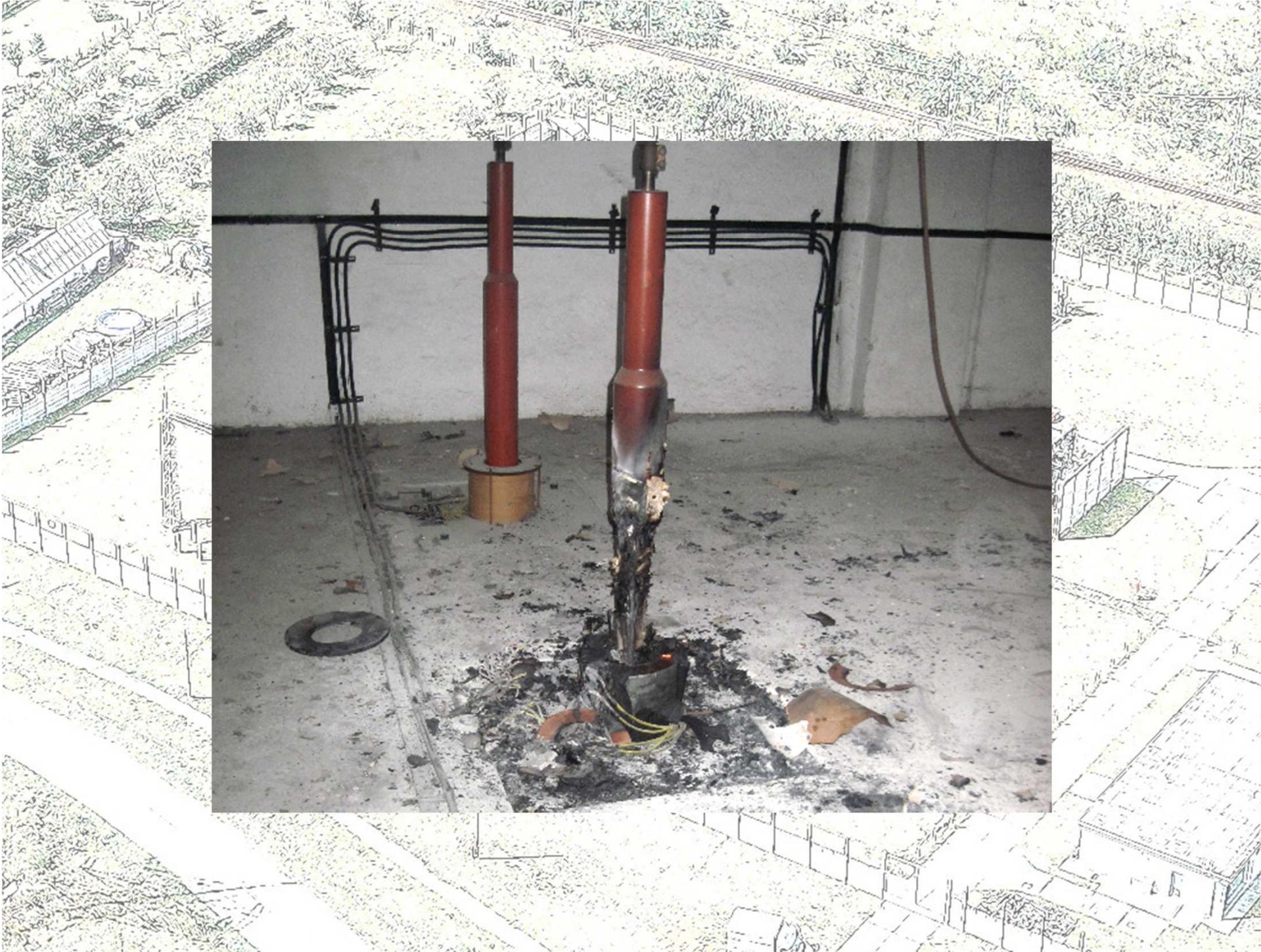
120 kV-os átvezető áramváltó



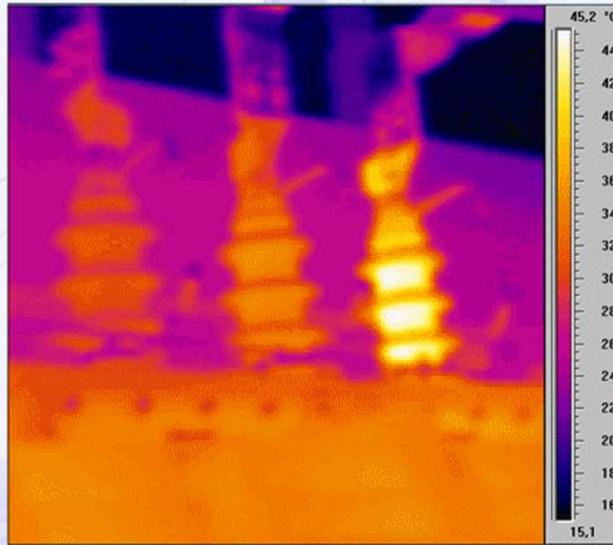
Object Parameter	Value
Emissivity	0.95
Object Distance	2.0 m
Reflected Temperature	20.0 °C
Atmospheric Temperature	20.0 °C
Atmospheric Transmission	0.99
Label	Value
Sp1	23.8 °C
Sp2	38.1 °C



Object Parameter	Value
Emissivity	0.95
Object Distance	2.0 m
Reflected Temperature	20.0 °C
Atmospheric Temperature	20.0 °C
Atmospheric Transmission	0.99
Label	Value
Sp1	8.8 °C
Sp2	27.7 °C



40 MVA-es 120/10 kV-os Yd transzformátor



2u - 45,1 °C

2v - 34,6 °C

2w - 30,9 °C

2u - 2v : 6,394 mΩ

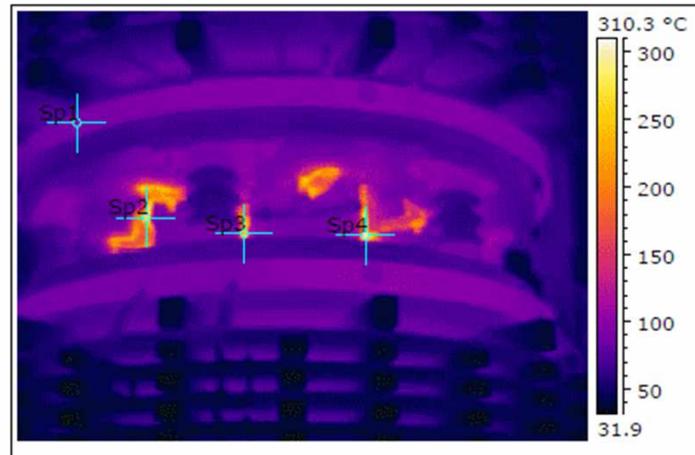
2v - 2w : 6,094 mΩ

2w - 2u : 6,332 mΩ



10 kV-os 1600 A-es fojtótekerecs

Terhelés: 1000 A



Sp1 Temperature	Sp2 Temperature	Sp3 Temperature	Sp4 Temperature	Sp5 Temperature
90.2 °C	284.5 °C	271.3 °C	305.3 °C	-

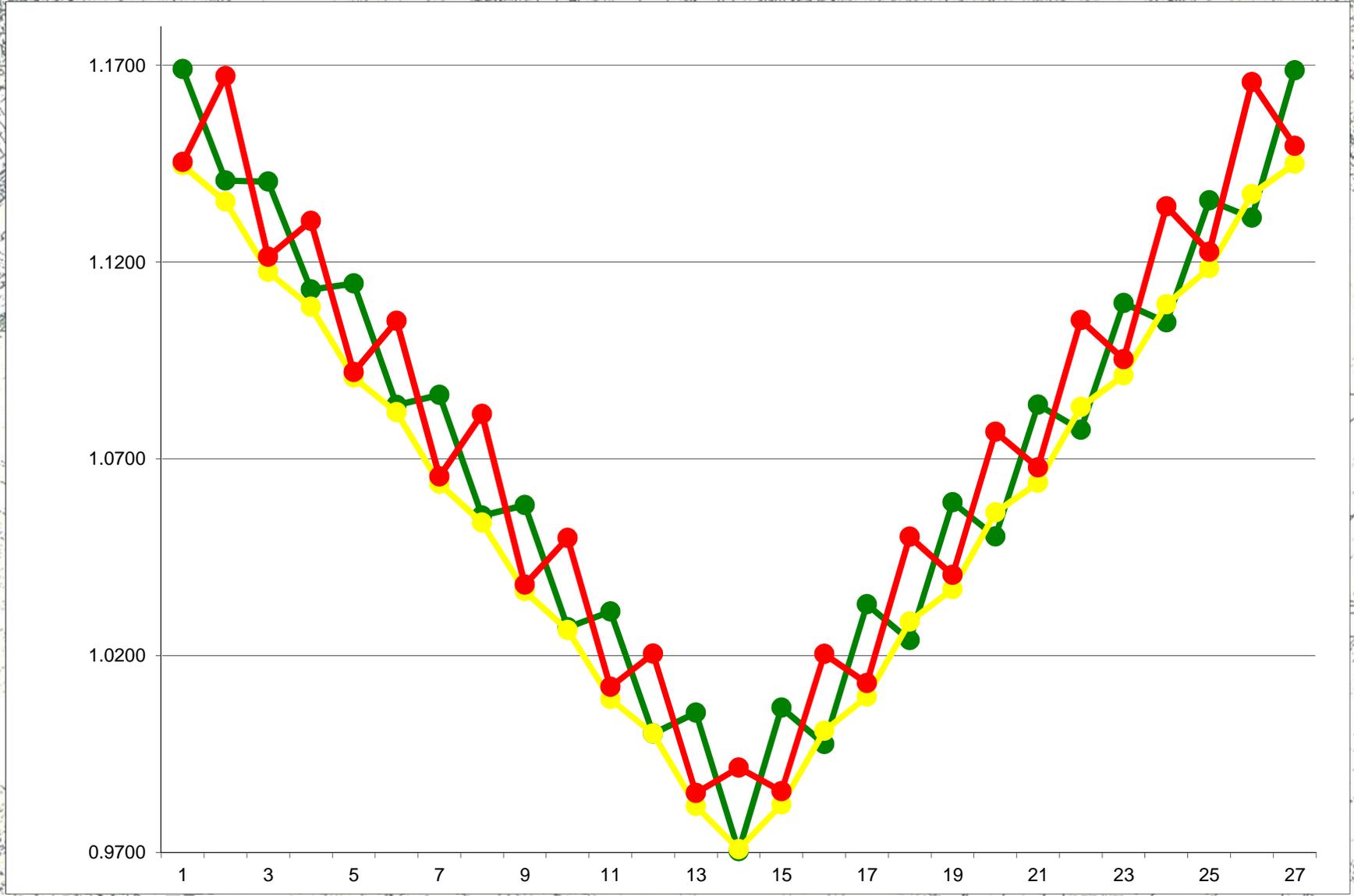




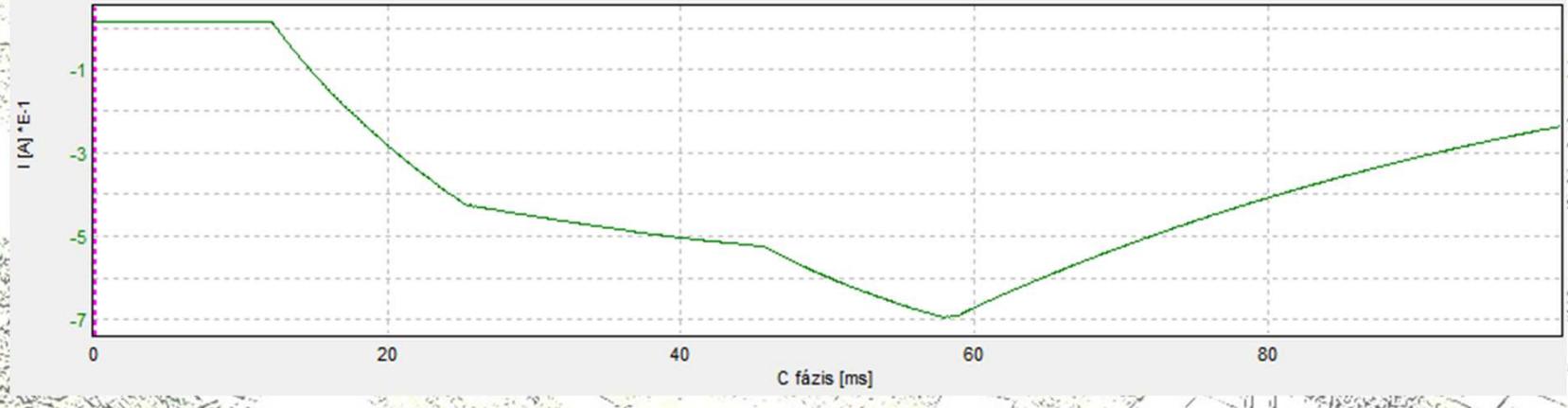
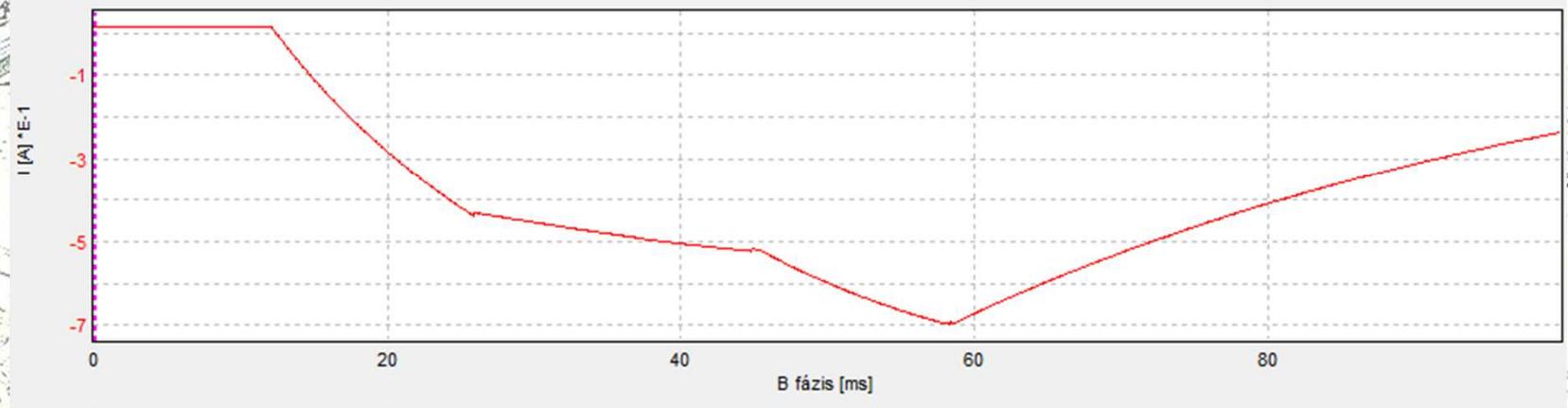
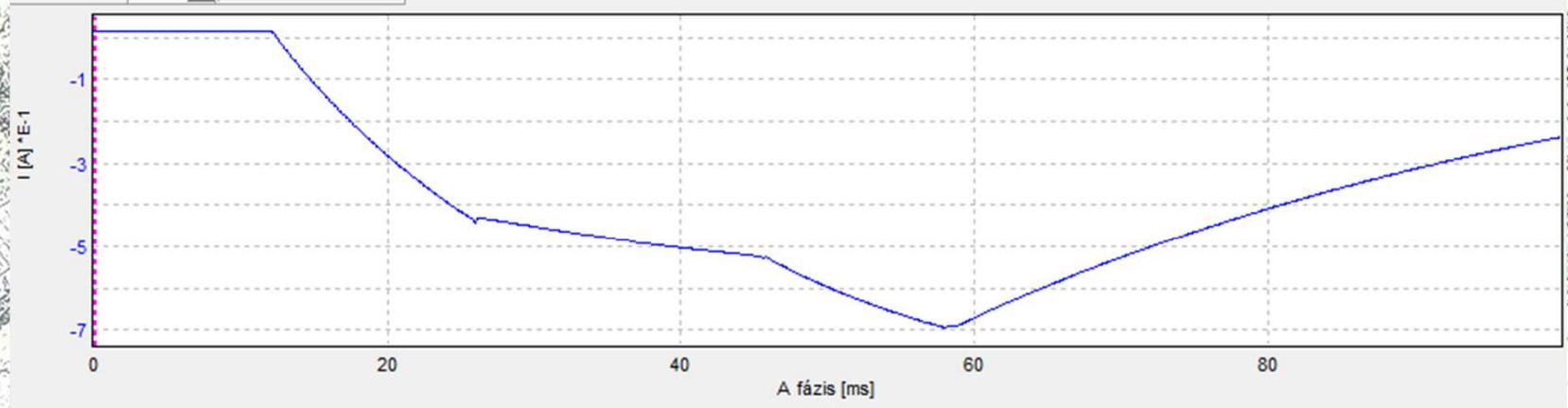
Egyenáramú tekercsellénálás mérés

(hibák az átkapcsolóban)

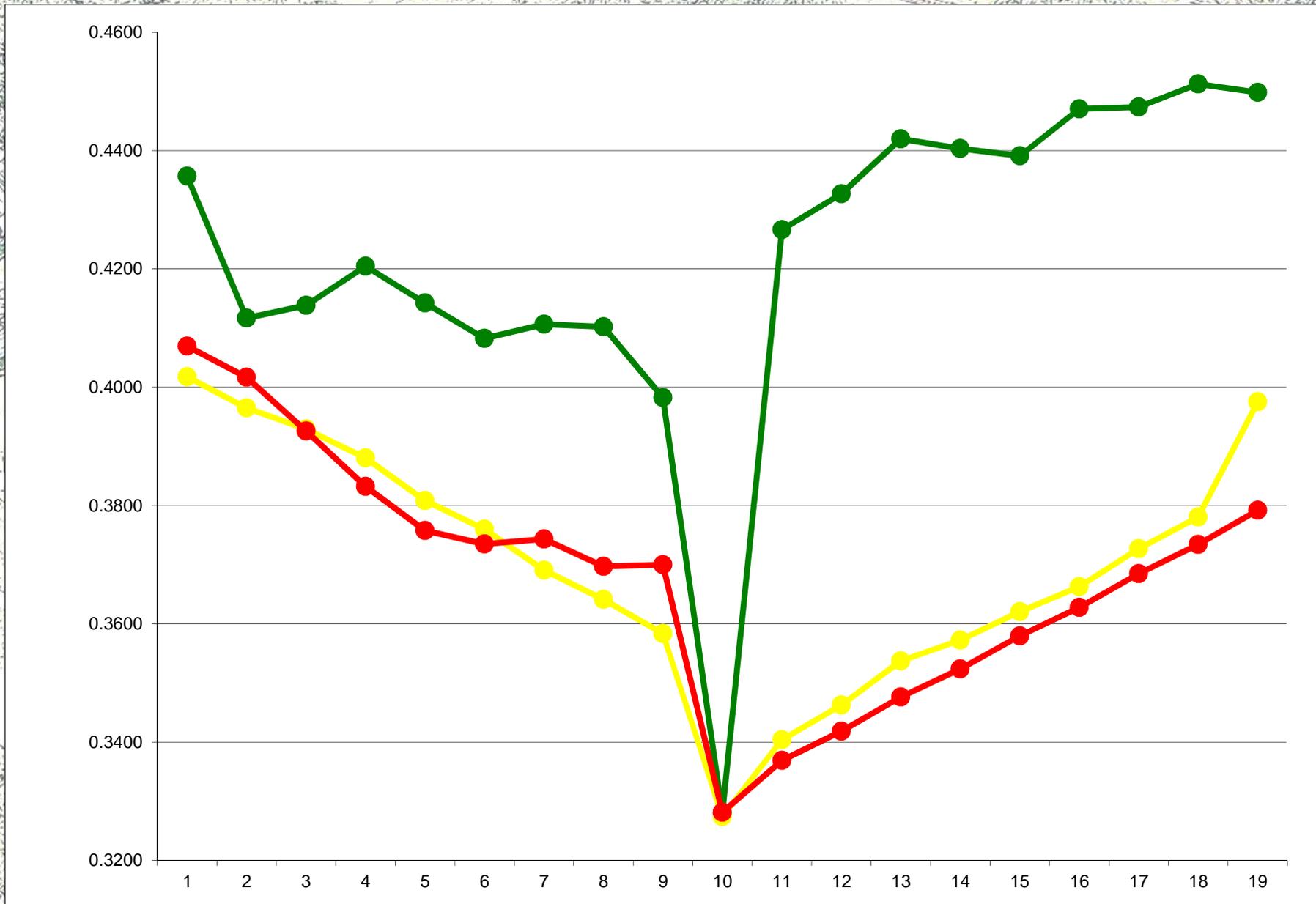
120/20 kV-os tr. Tek.ell. mérés



Fokozat: 1 1 → 2

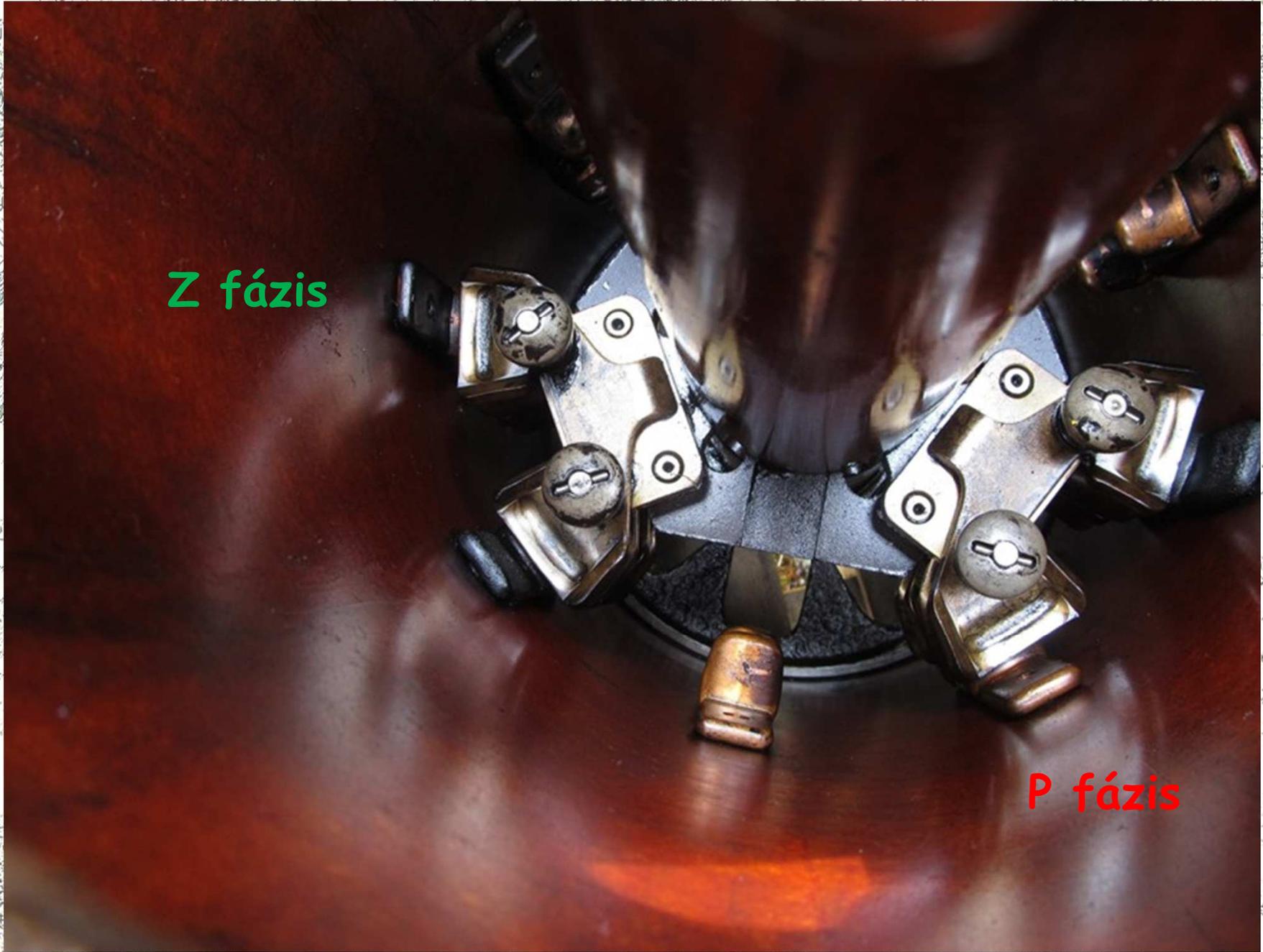


35/20 kV-os tr. C III 250 Y-45 tip. átkapcsoló



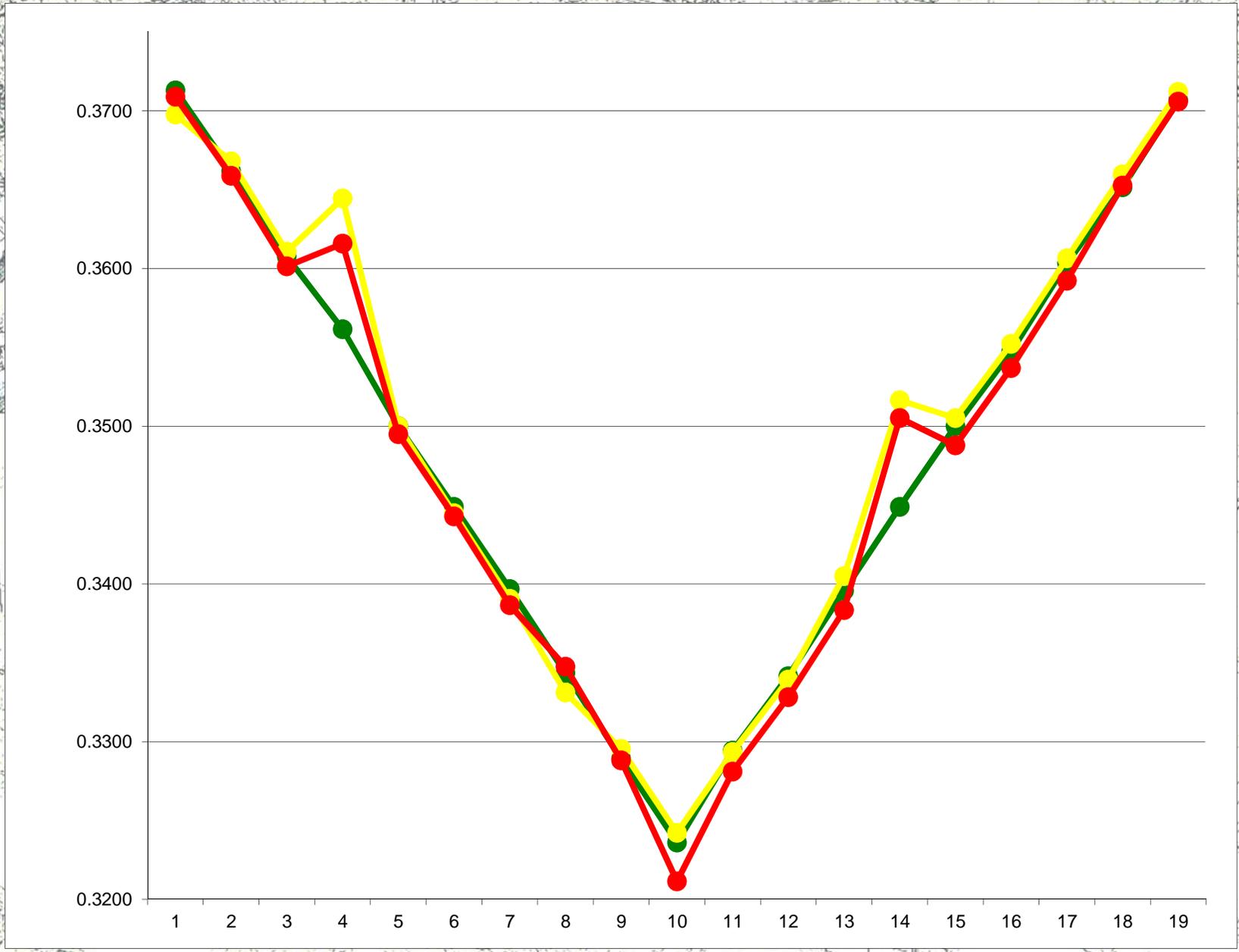
Z fázis

P fázis

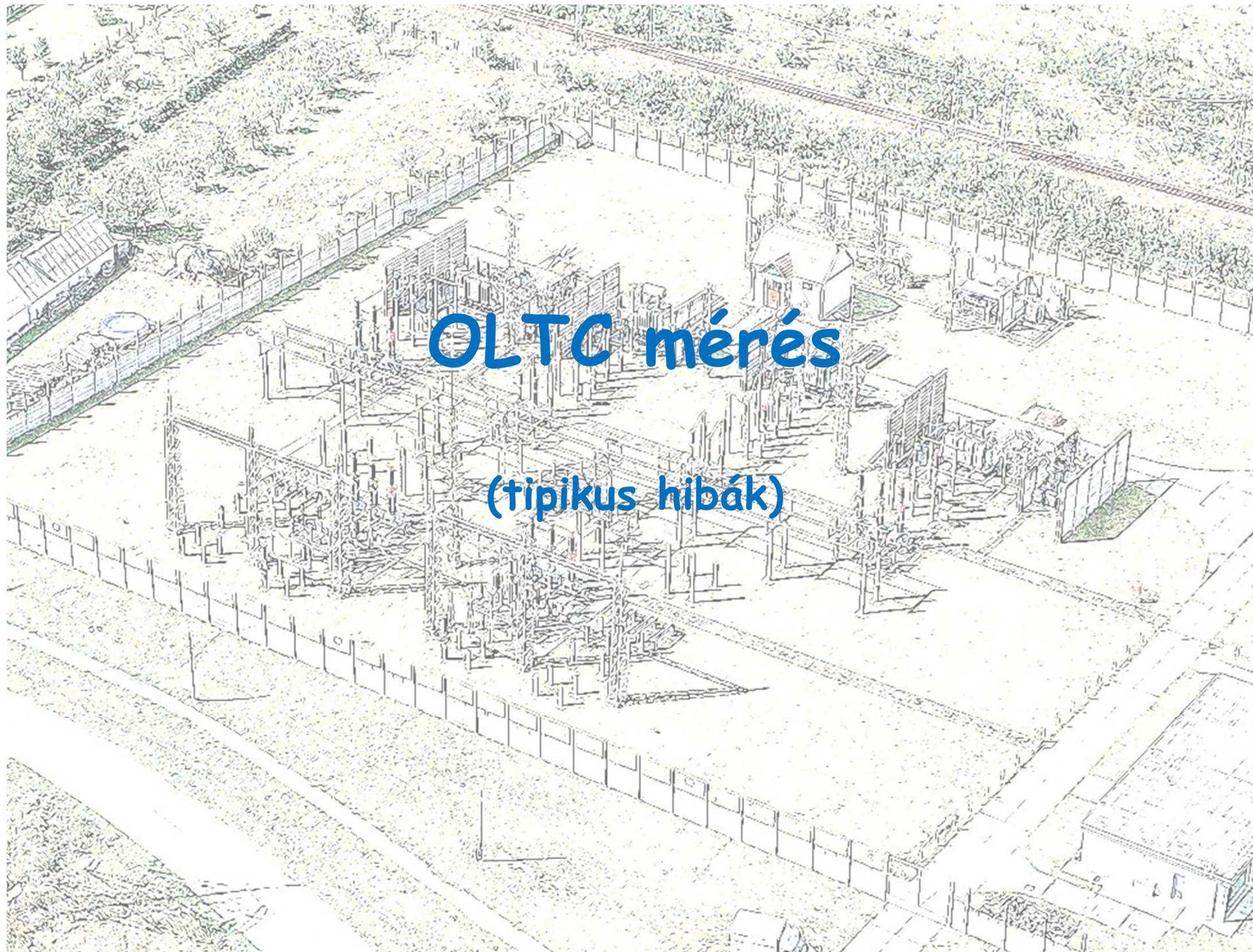








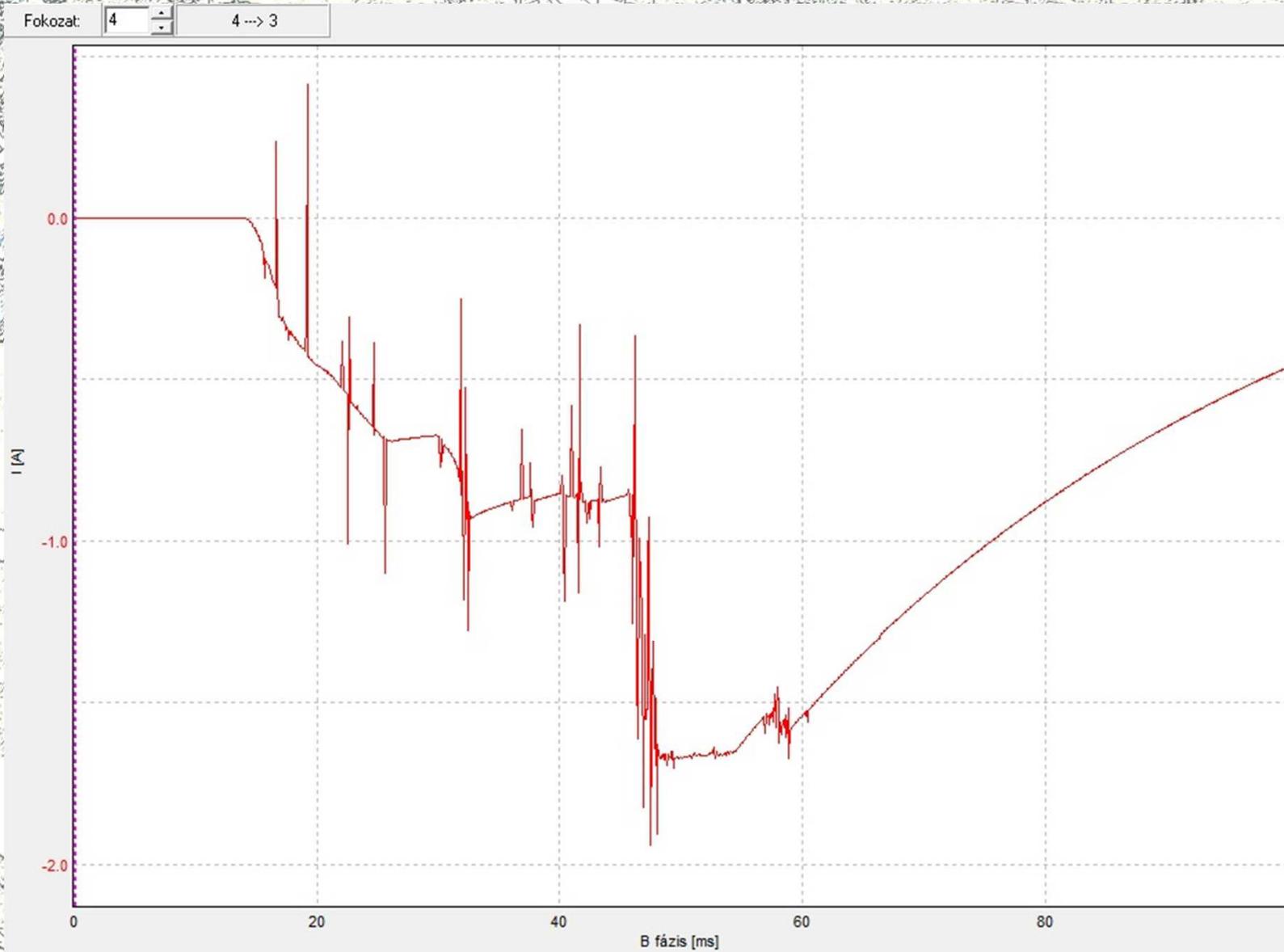


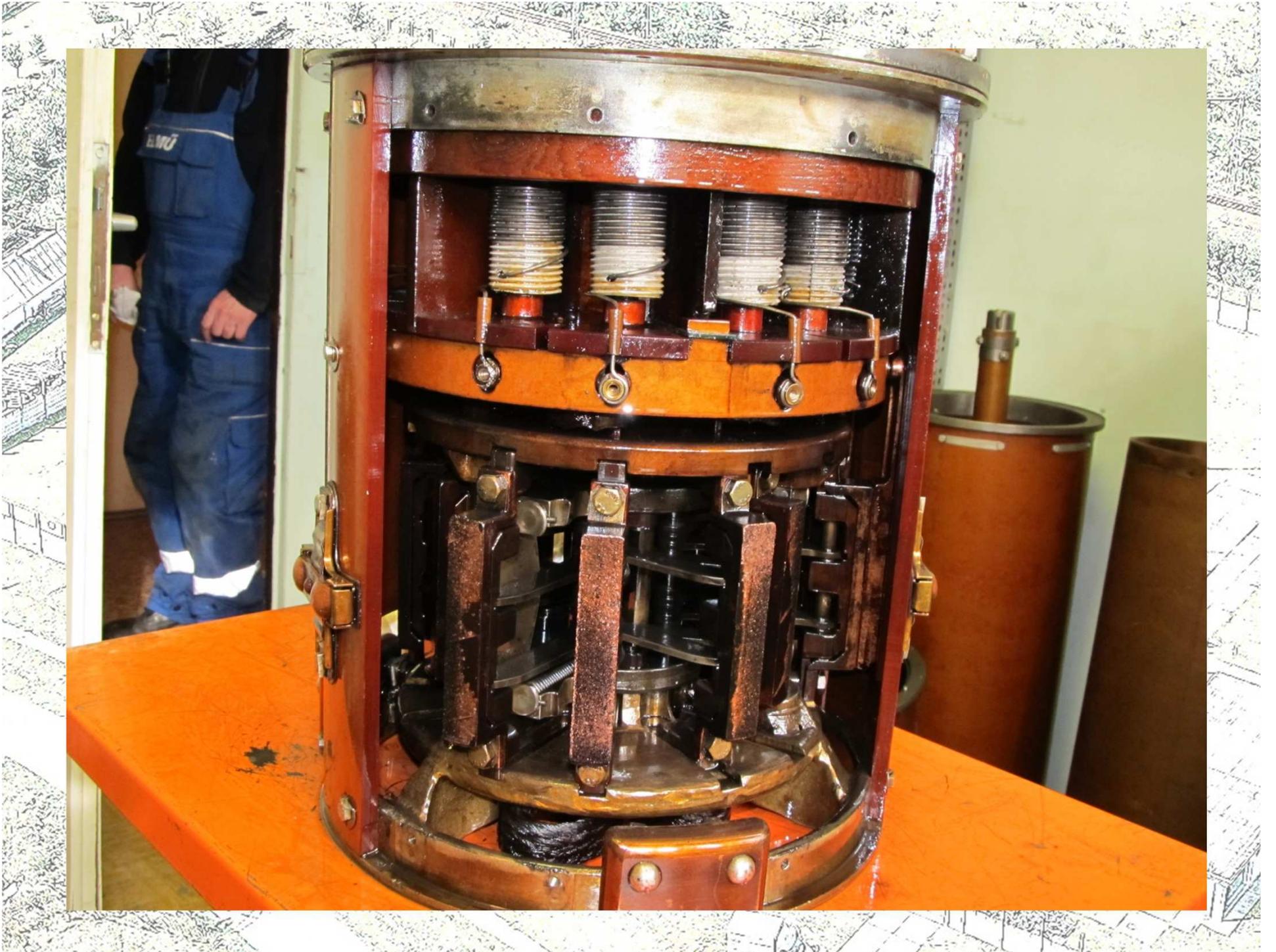


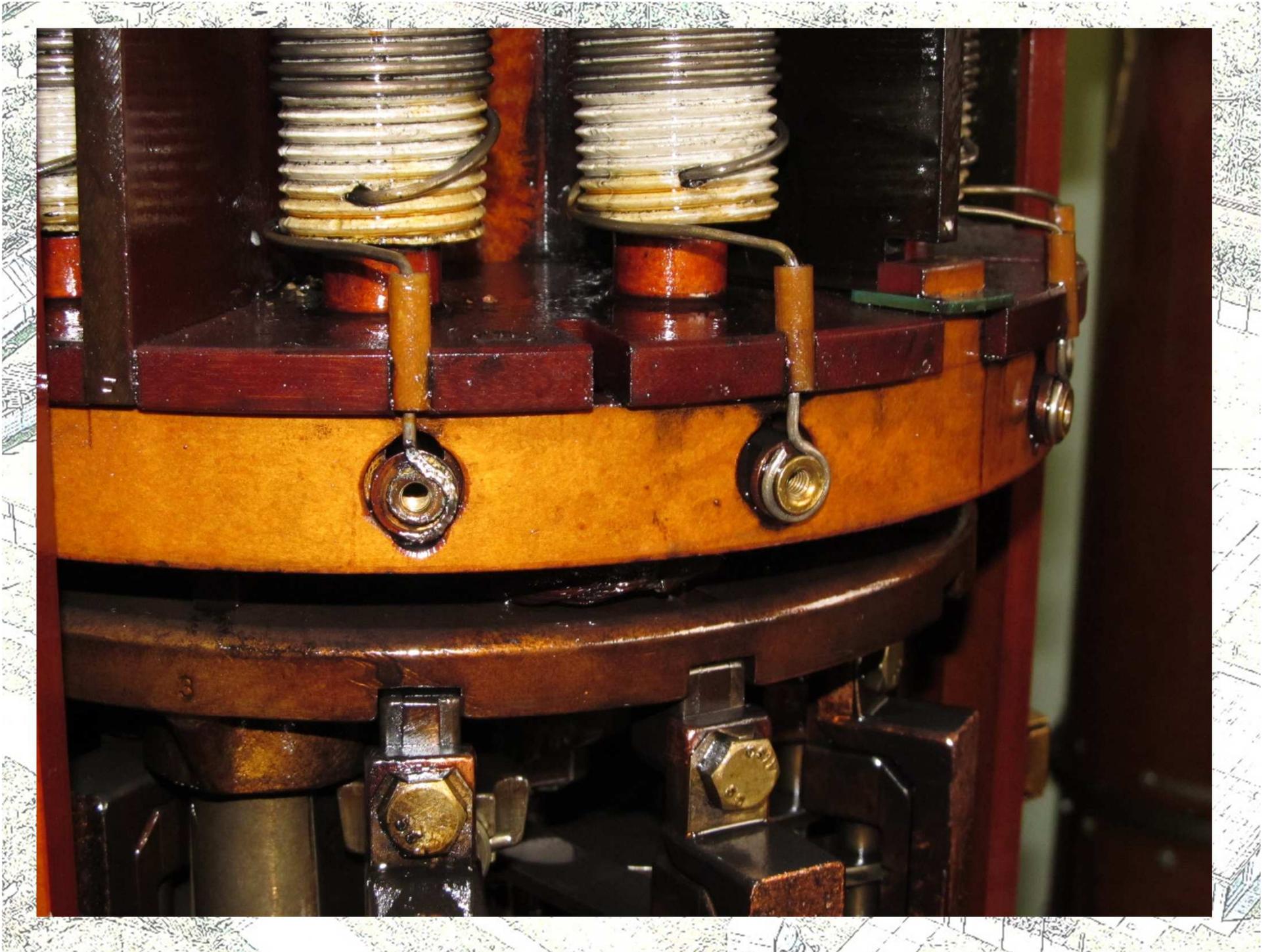
OLTC mérés

(tipikus hibák)

DIII-300-as átkapcsoló ellenállás szakadás

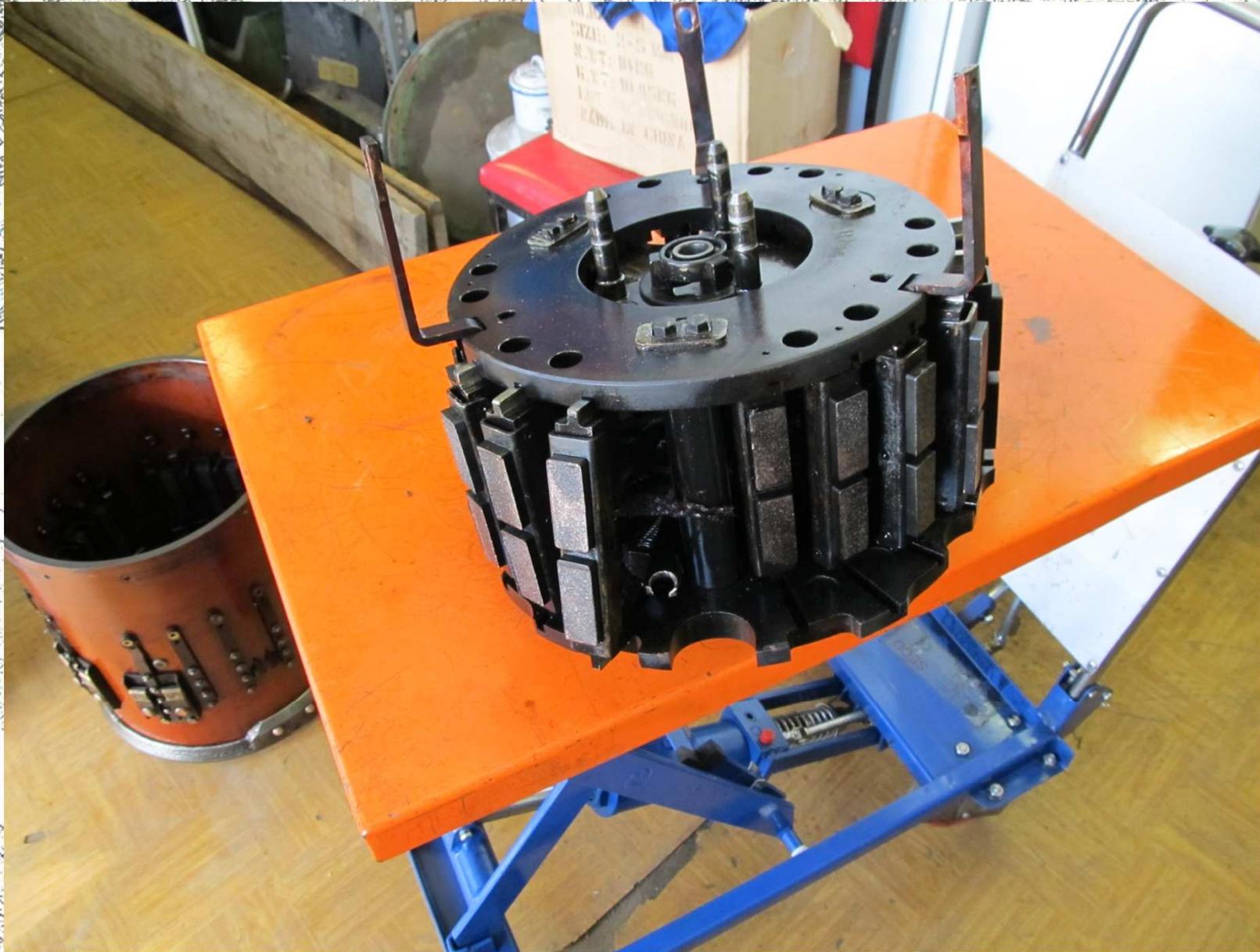






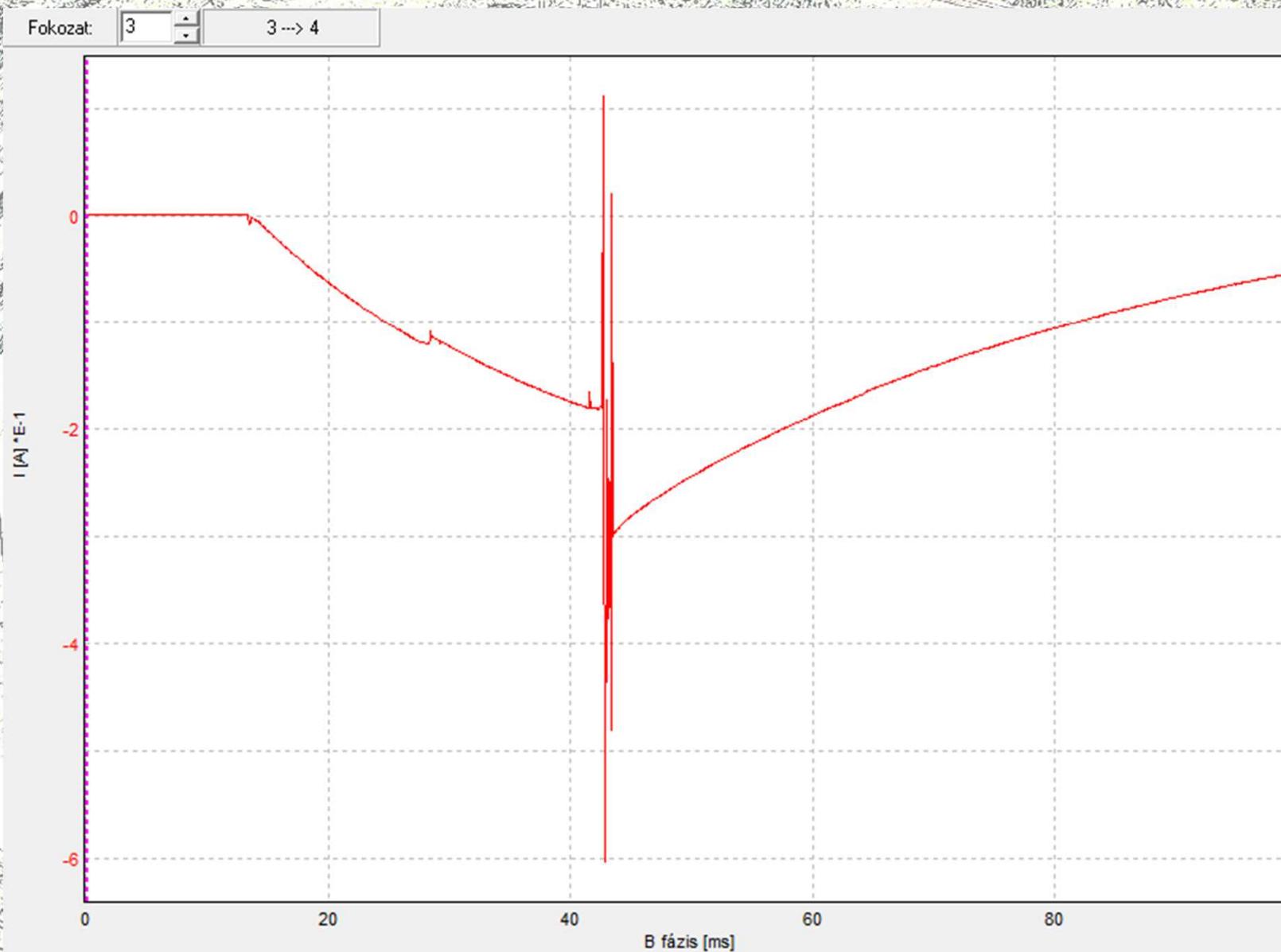


DIII-400-as átkapcsoló pászma szakadás

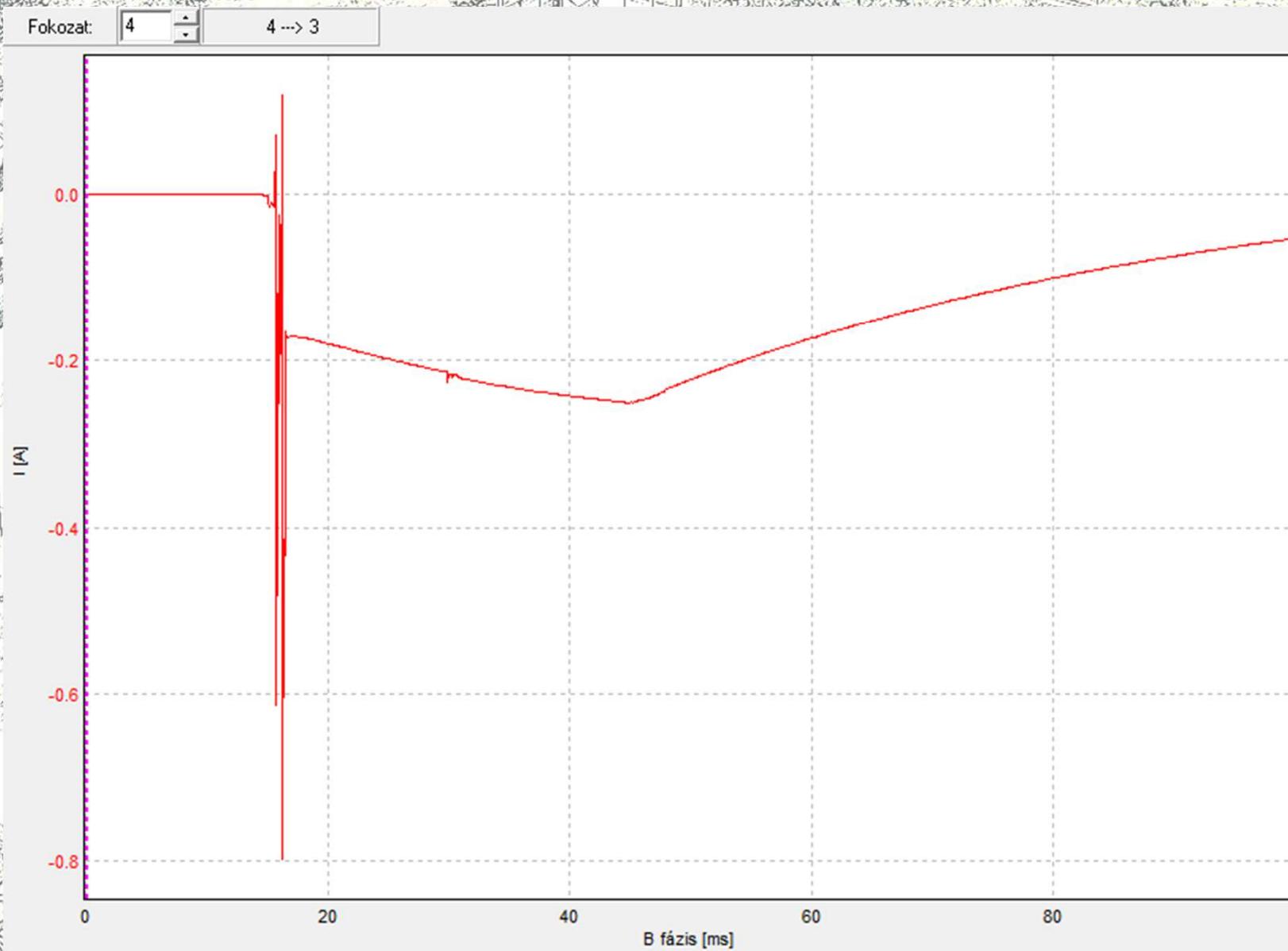


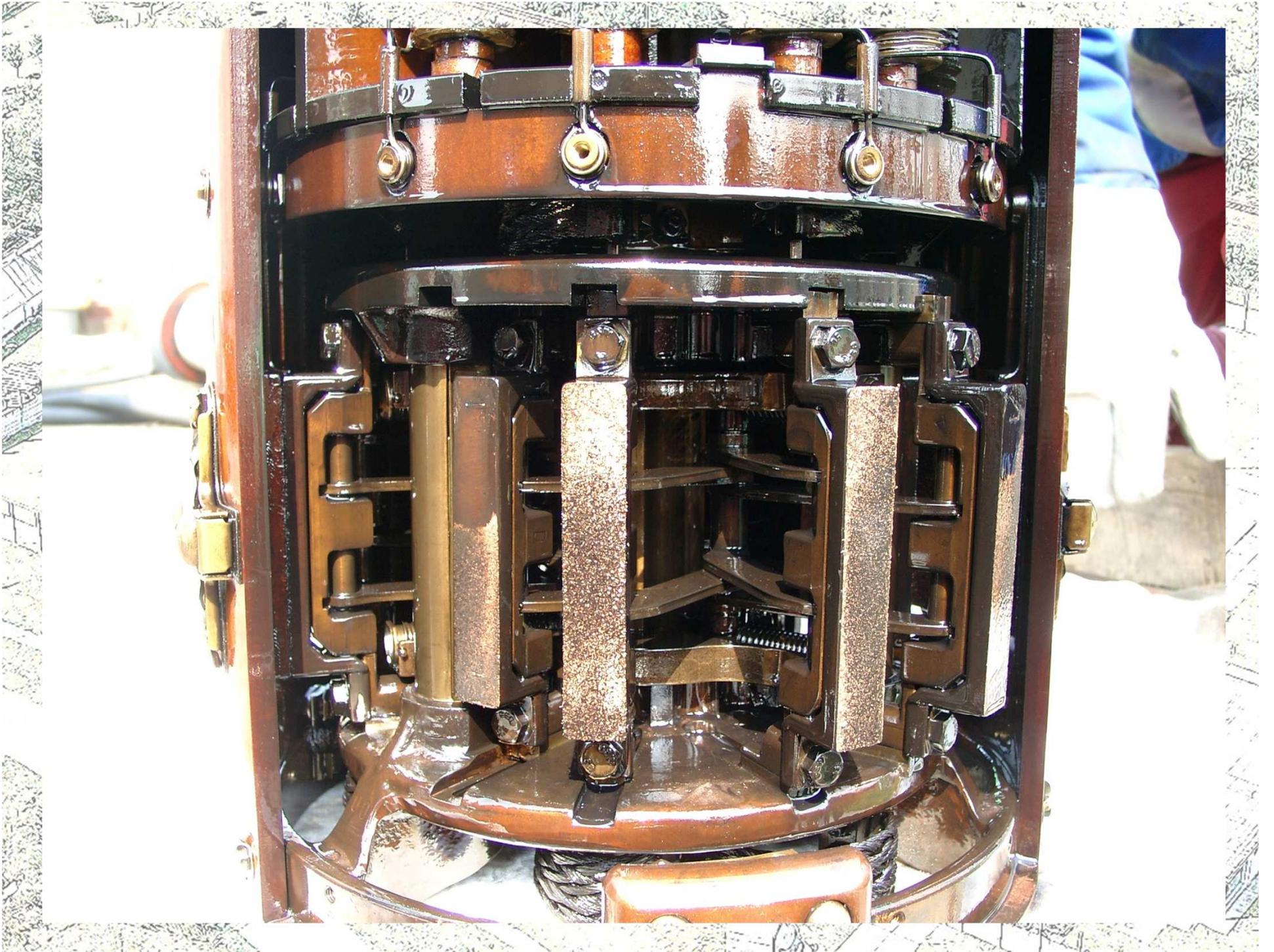


DIII-300-as átkapcsoló érintkező hiba



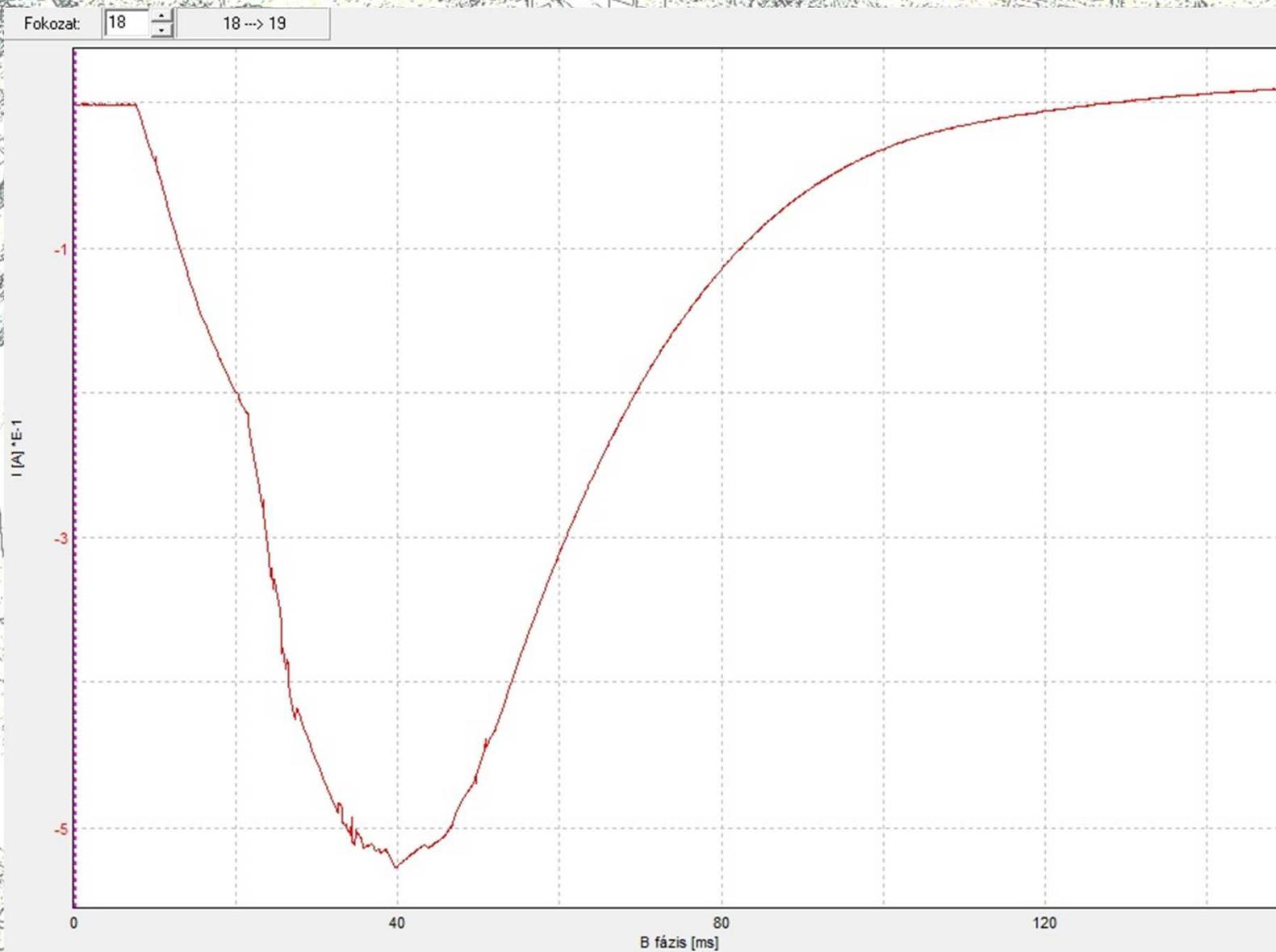
DIII-300-as átkapcsoló érintkező hiba



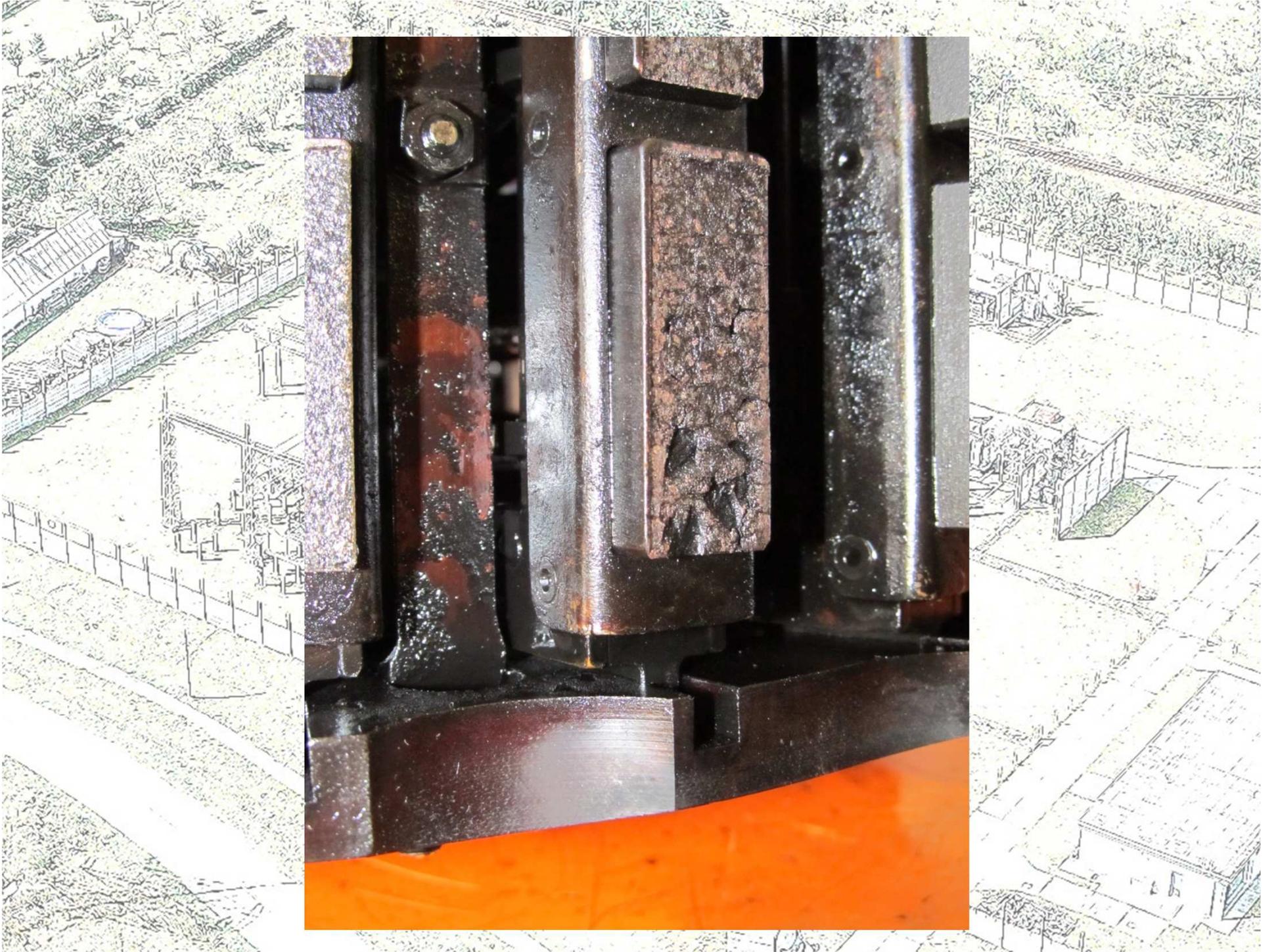




DIII-400-as átkapcsoló érintkező hiba

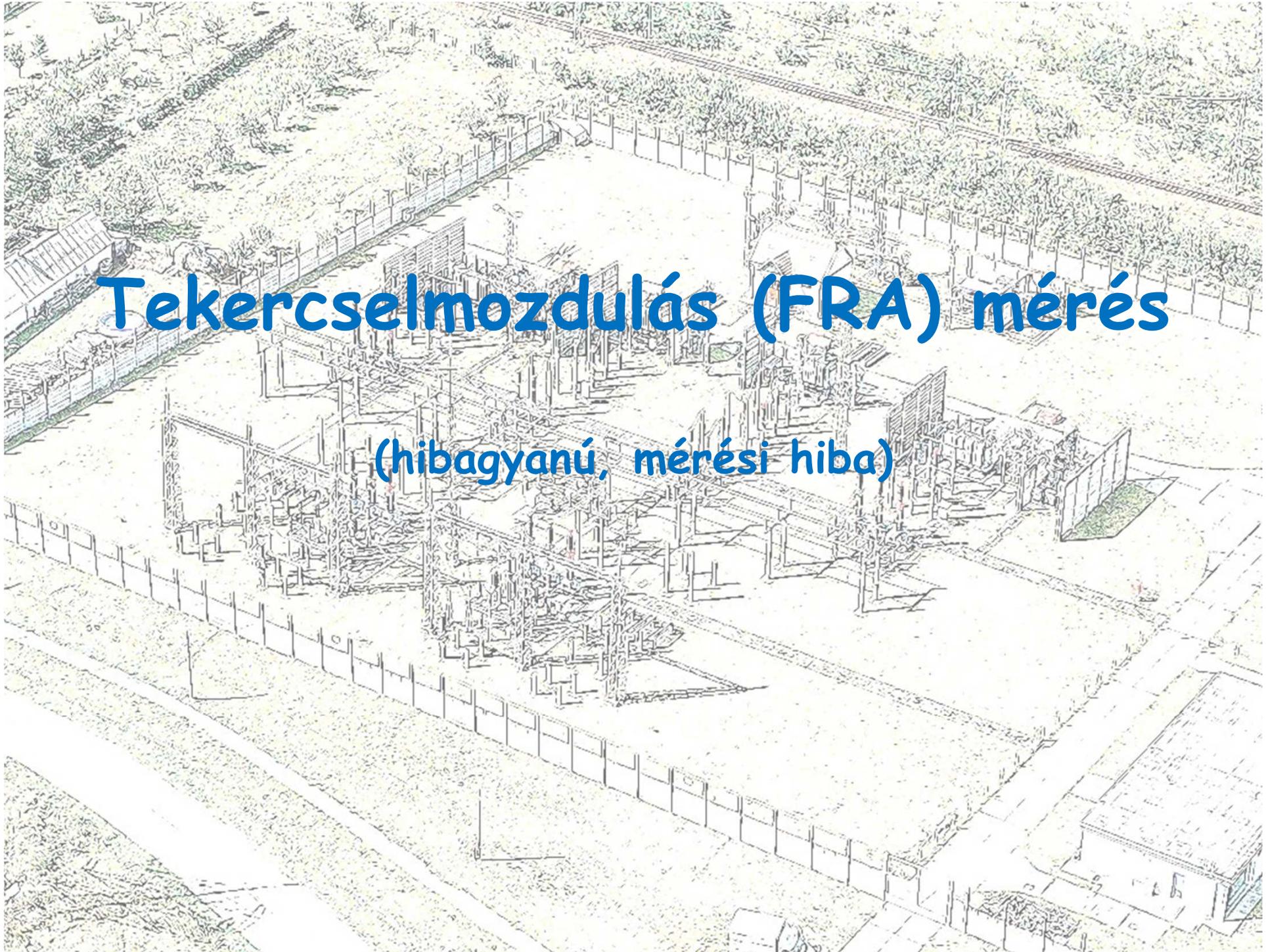






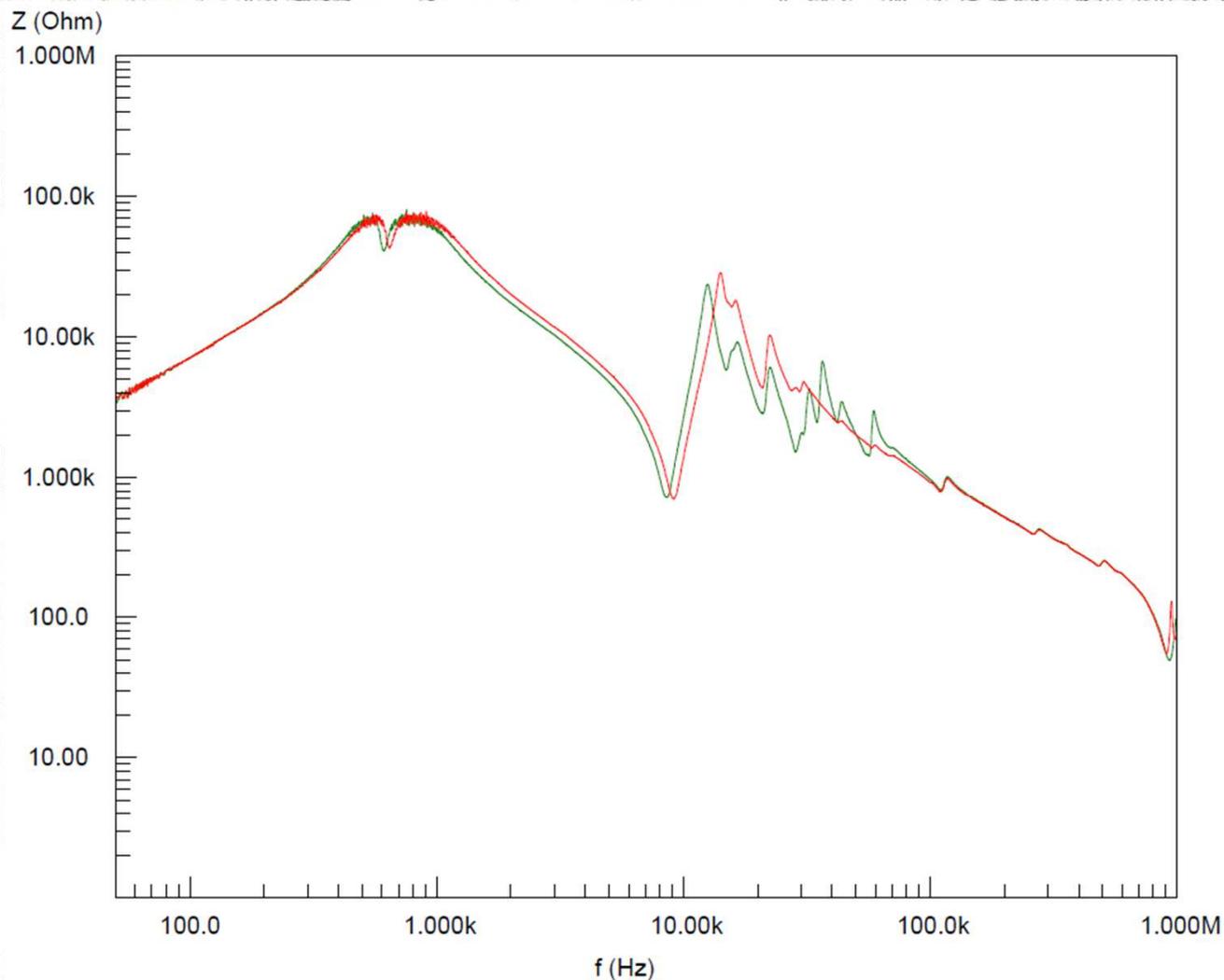
Tekercselmozdulás (FRA) mérés

(hibagyanú, mérési hiba)

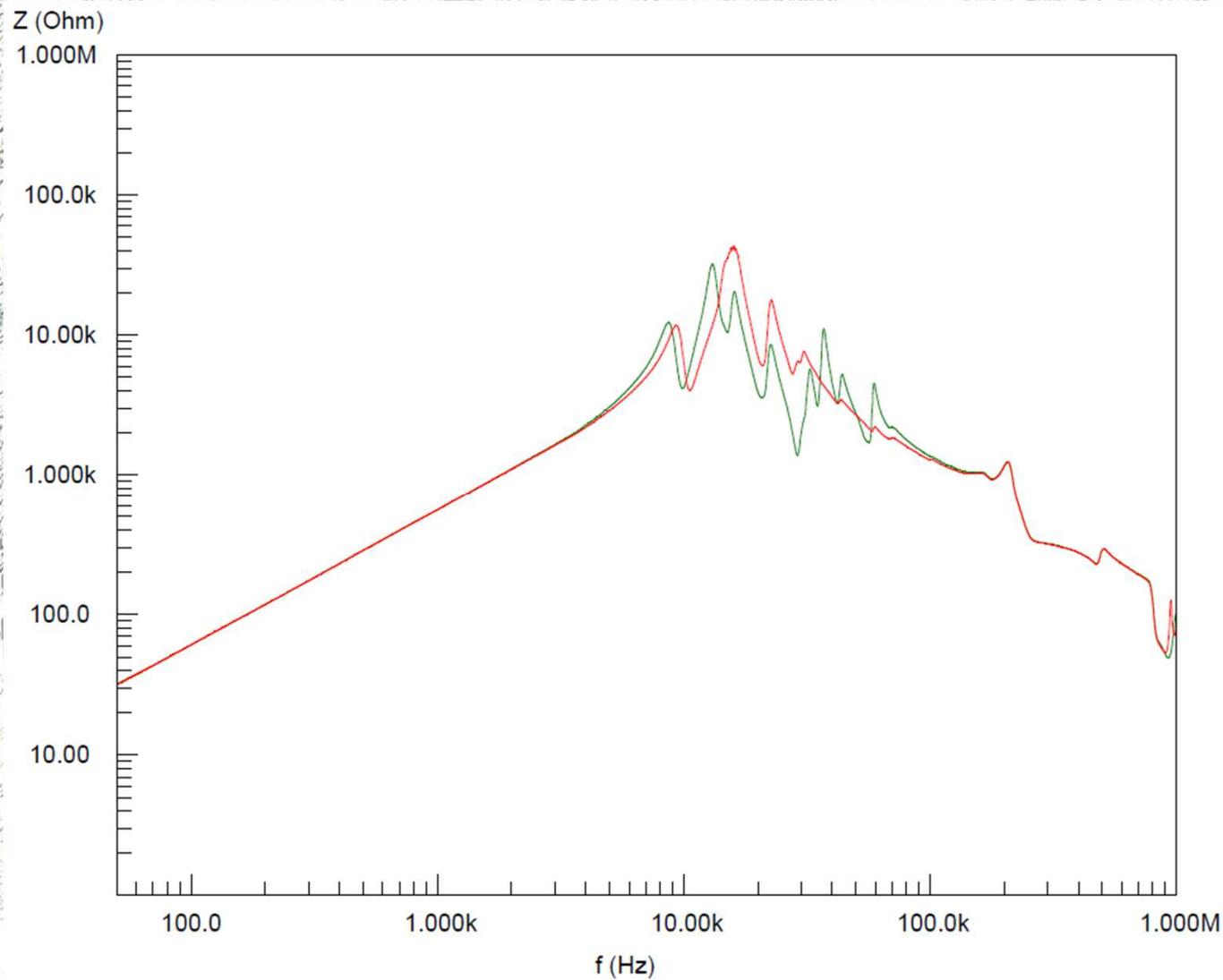


120/10 kV-os 63 MVA-es tr 14-es fokozat alulról és felülről

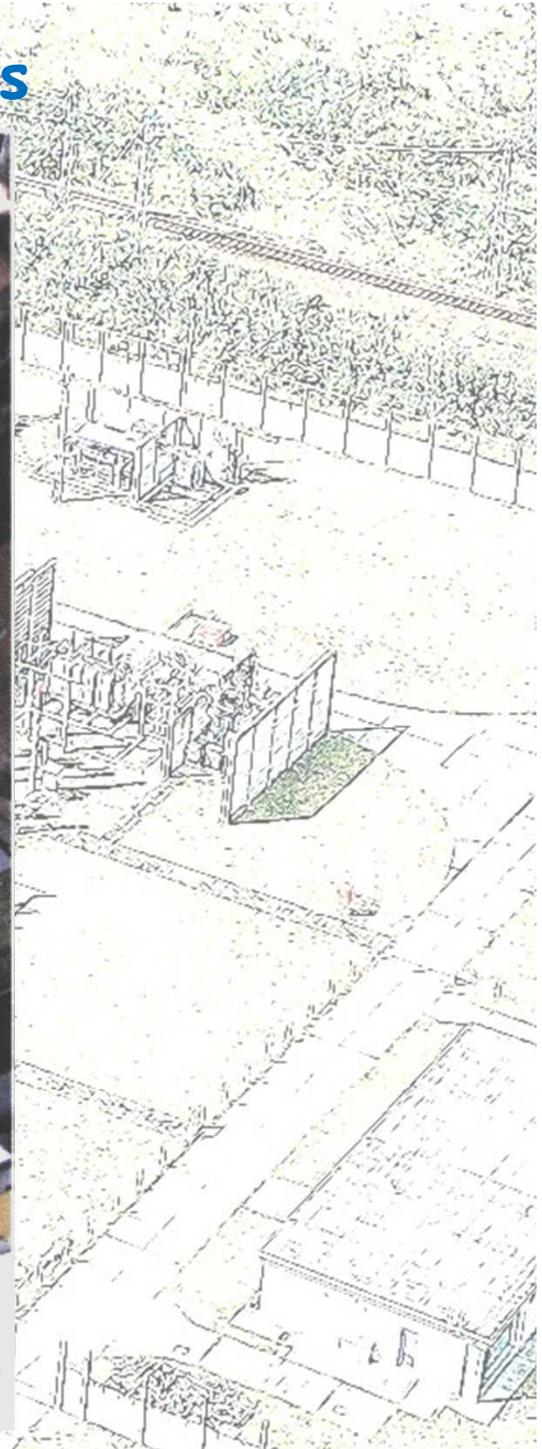
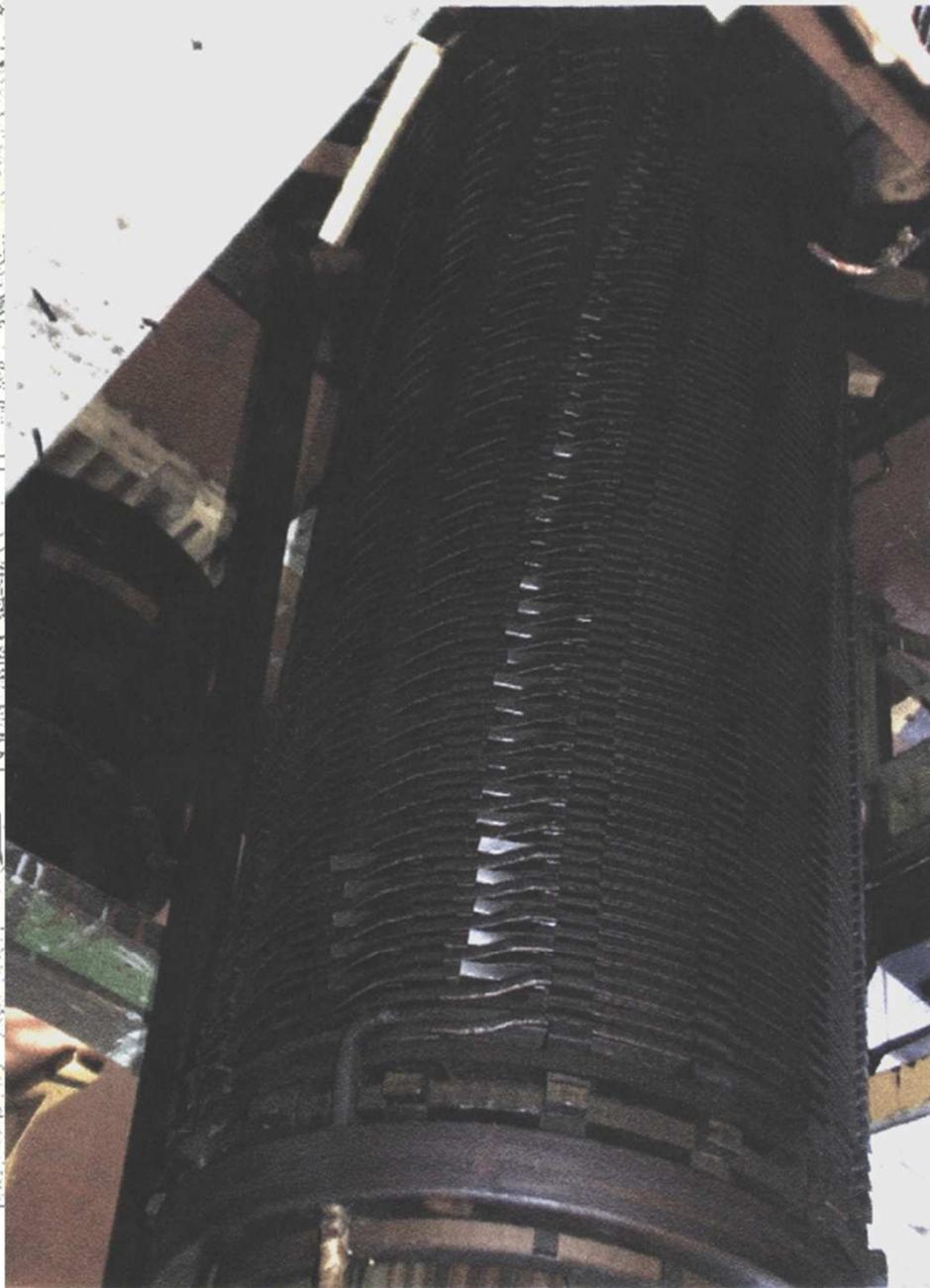
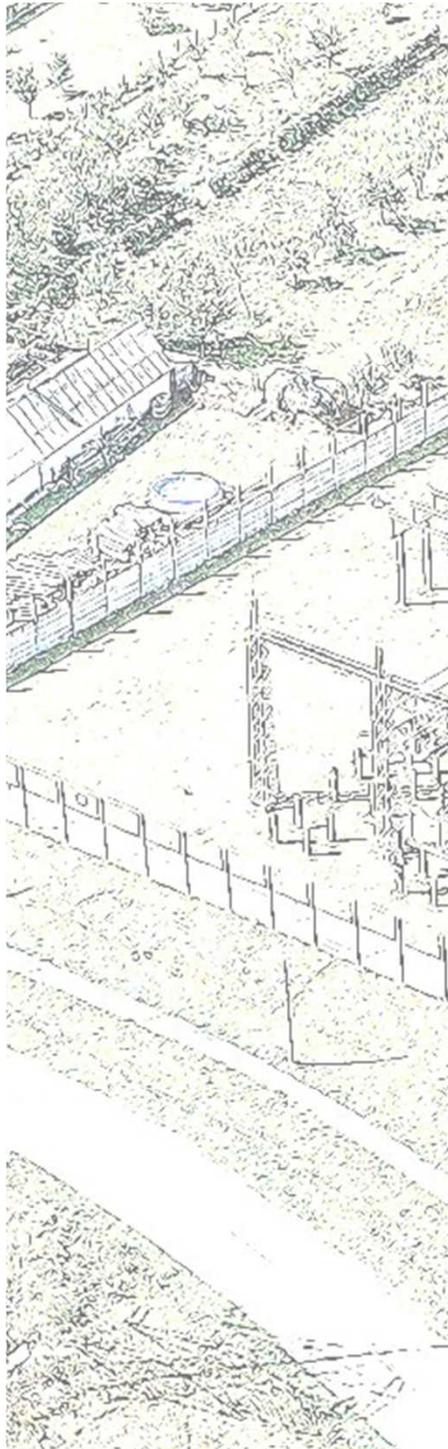
Nyitott szekunder 13-ból - 15.-ből



Rövidrezárt-földelt szekunder 13-ból - 15.-ből

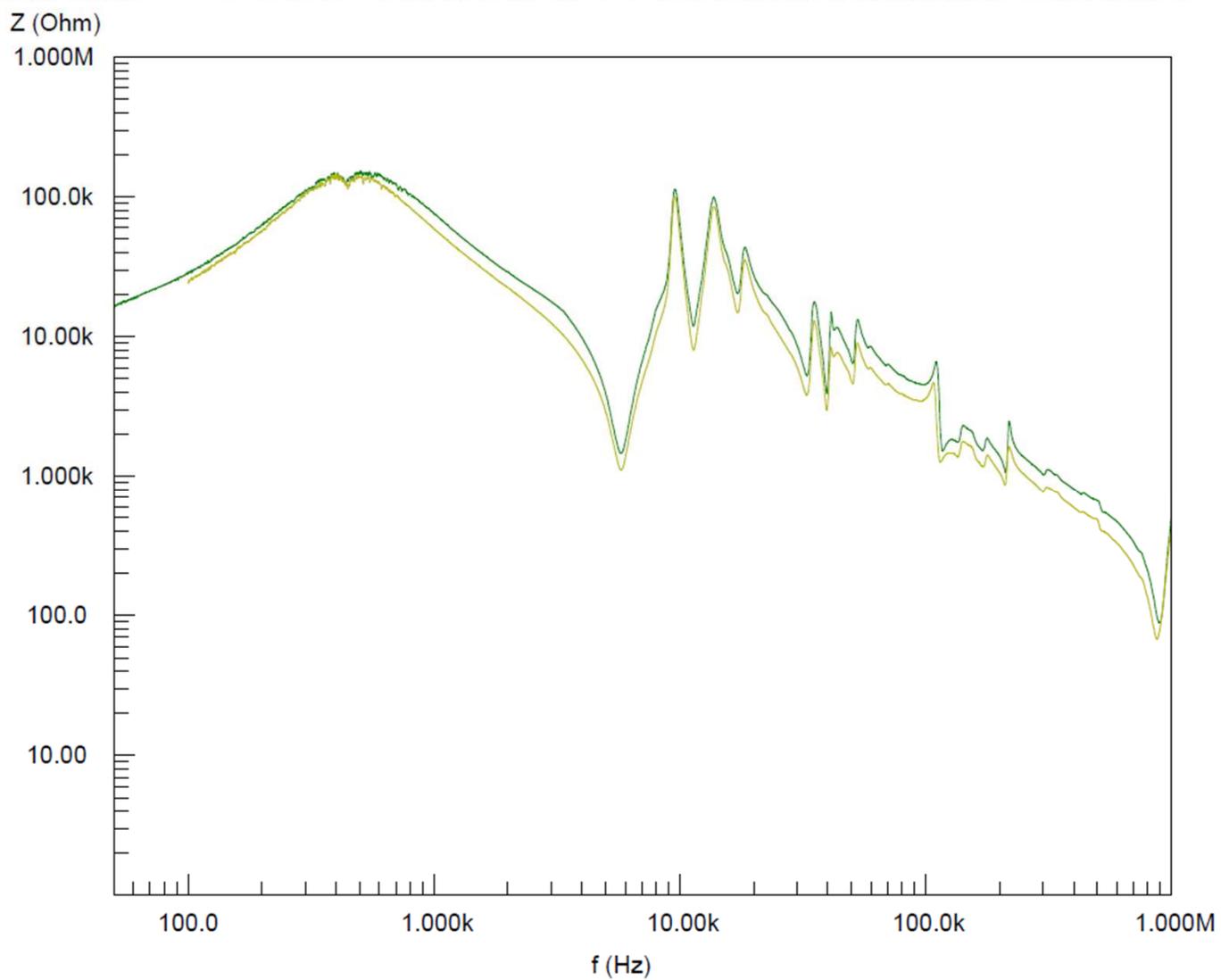


120/20 kV-os tr. „k” tekerecs



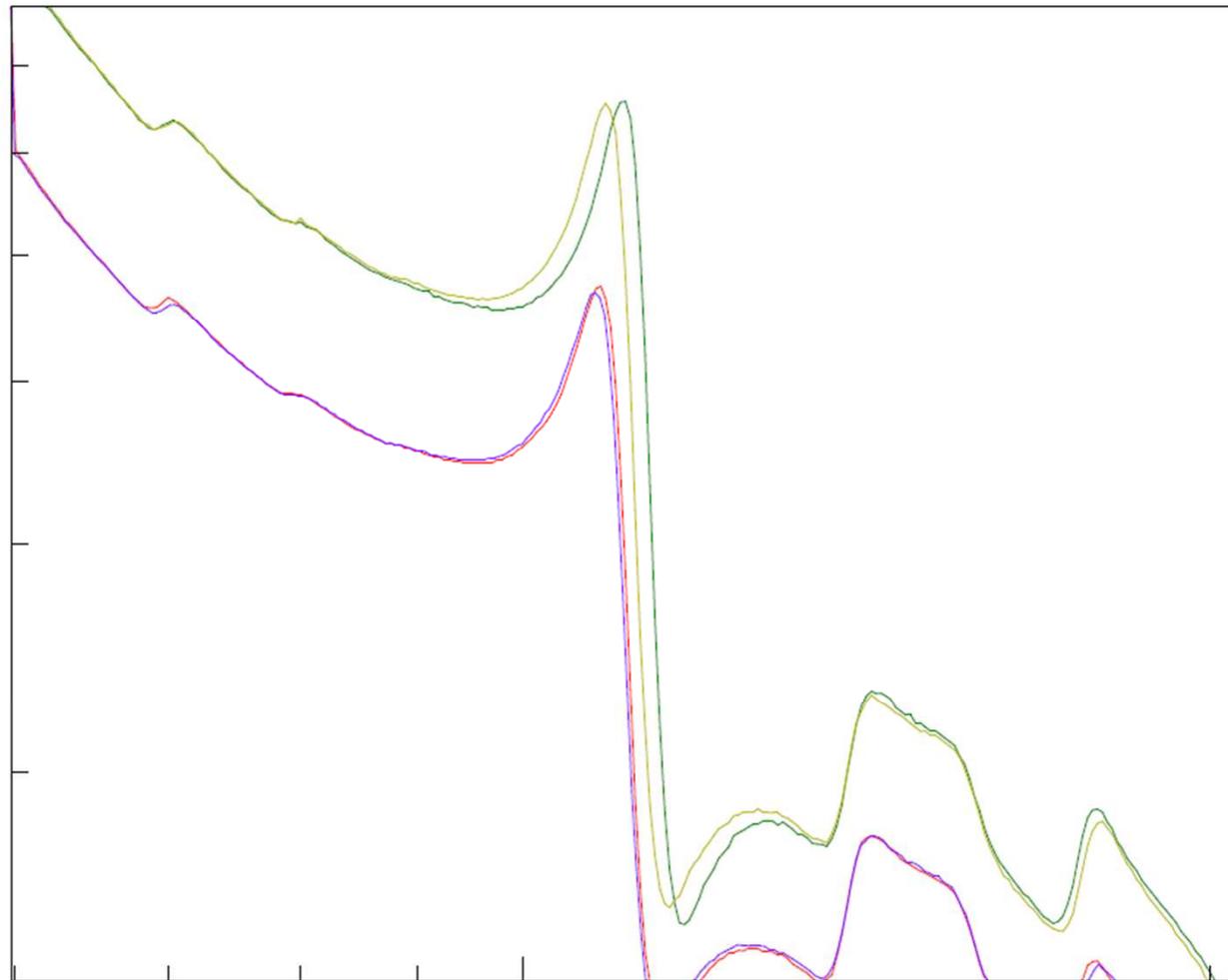
120/20 kV-os tr. C tekercs (nyitott szekunder)

2005. – 2015.



2005. - 2009. - 2015. - 2016.

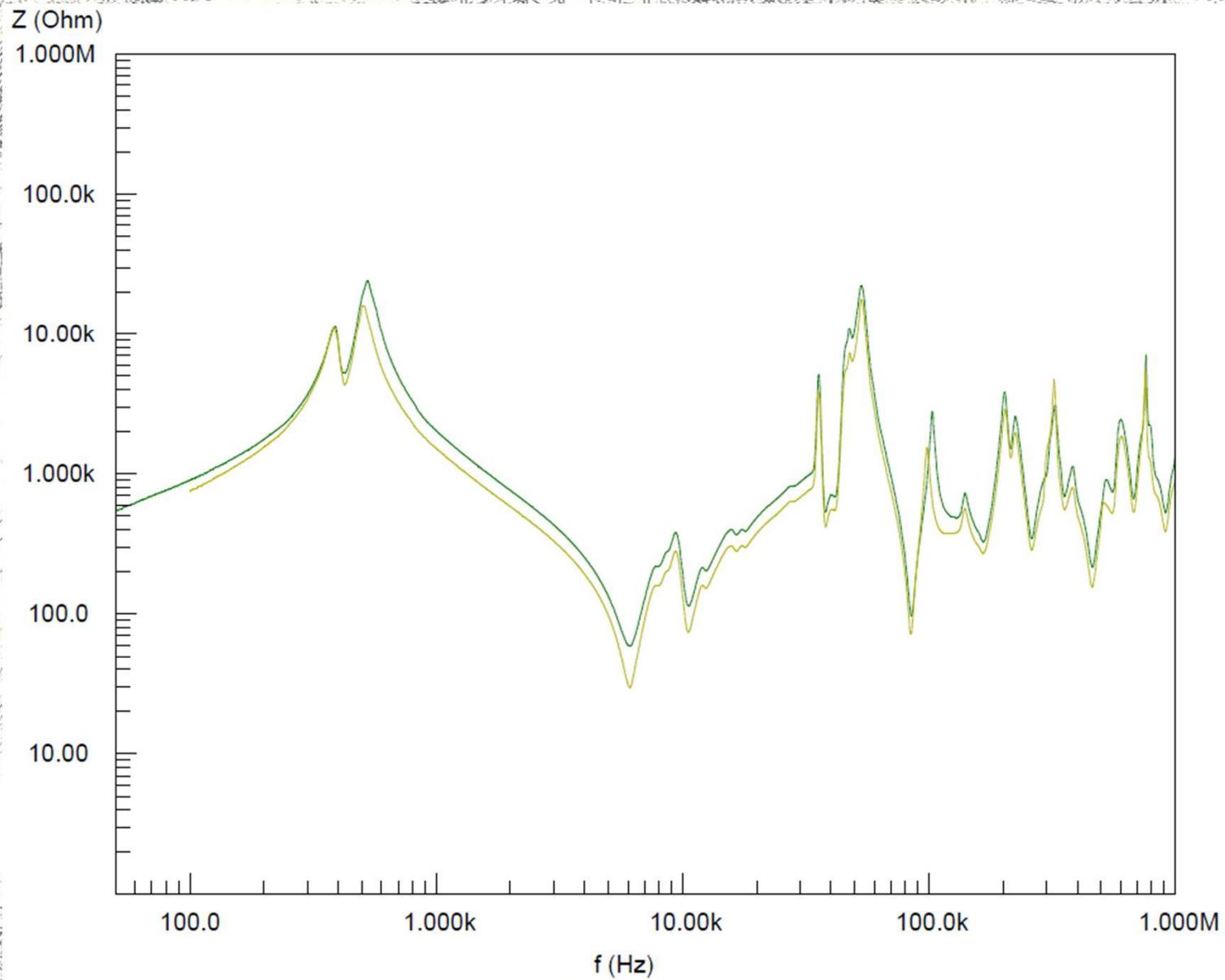
Z (Ohm)



100.0k

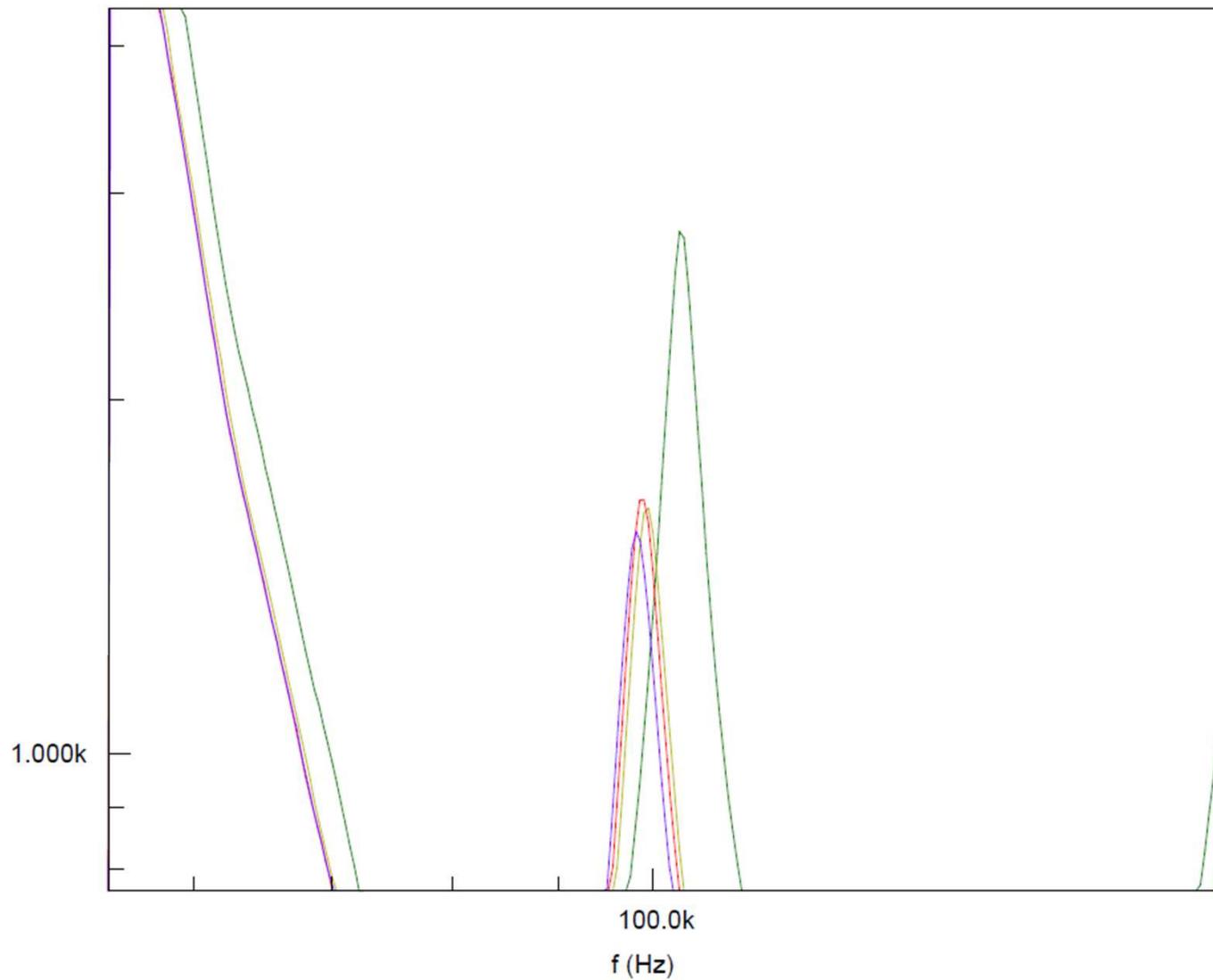
f (Hz)

20 kV-os oldal c tekerecs (nyitott primer) 2005. - 2015.

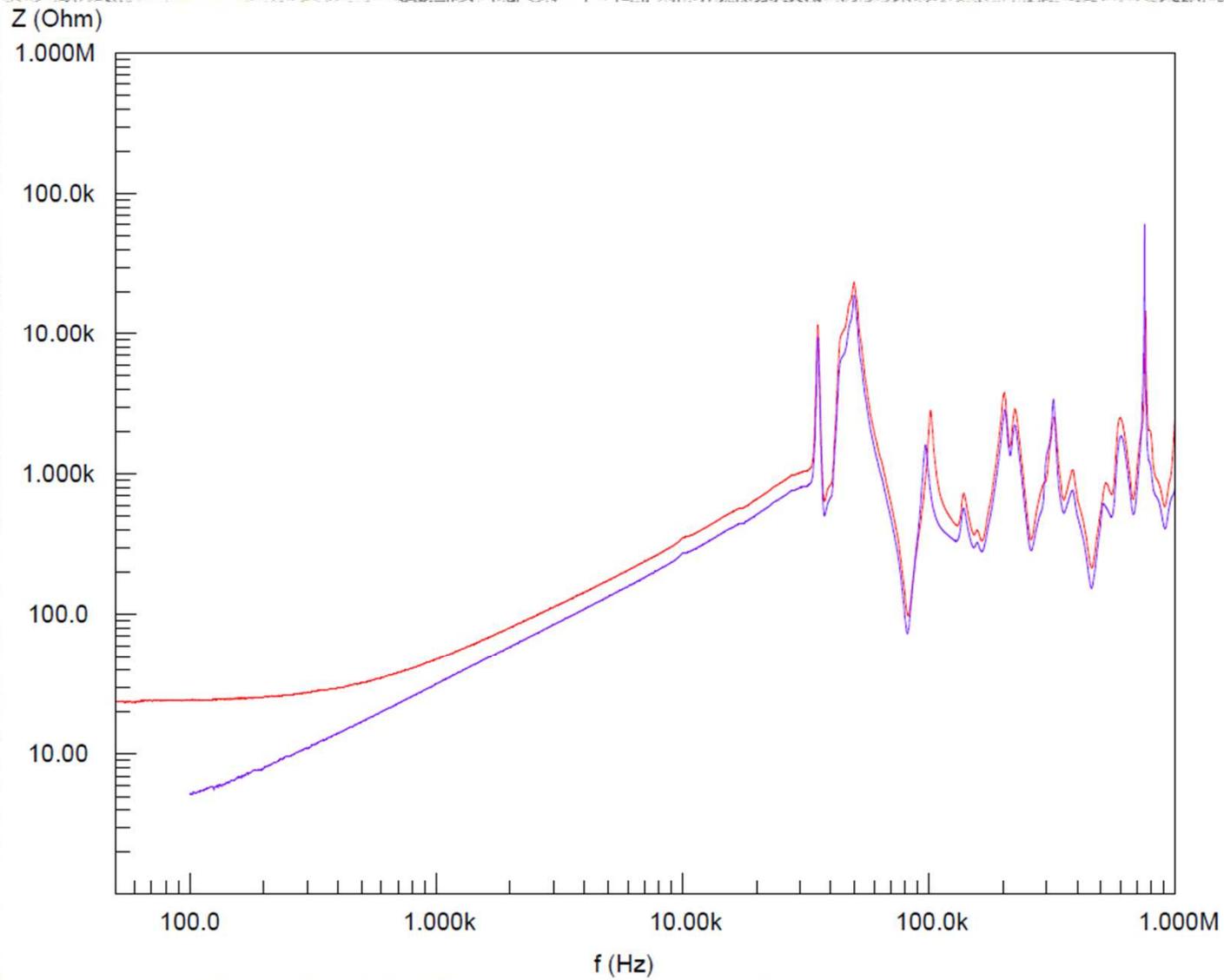


2005 . - 2009 . - 2015 . - 2016 .

Z (Ohm)

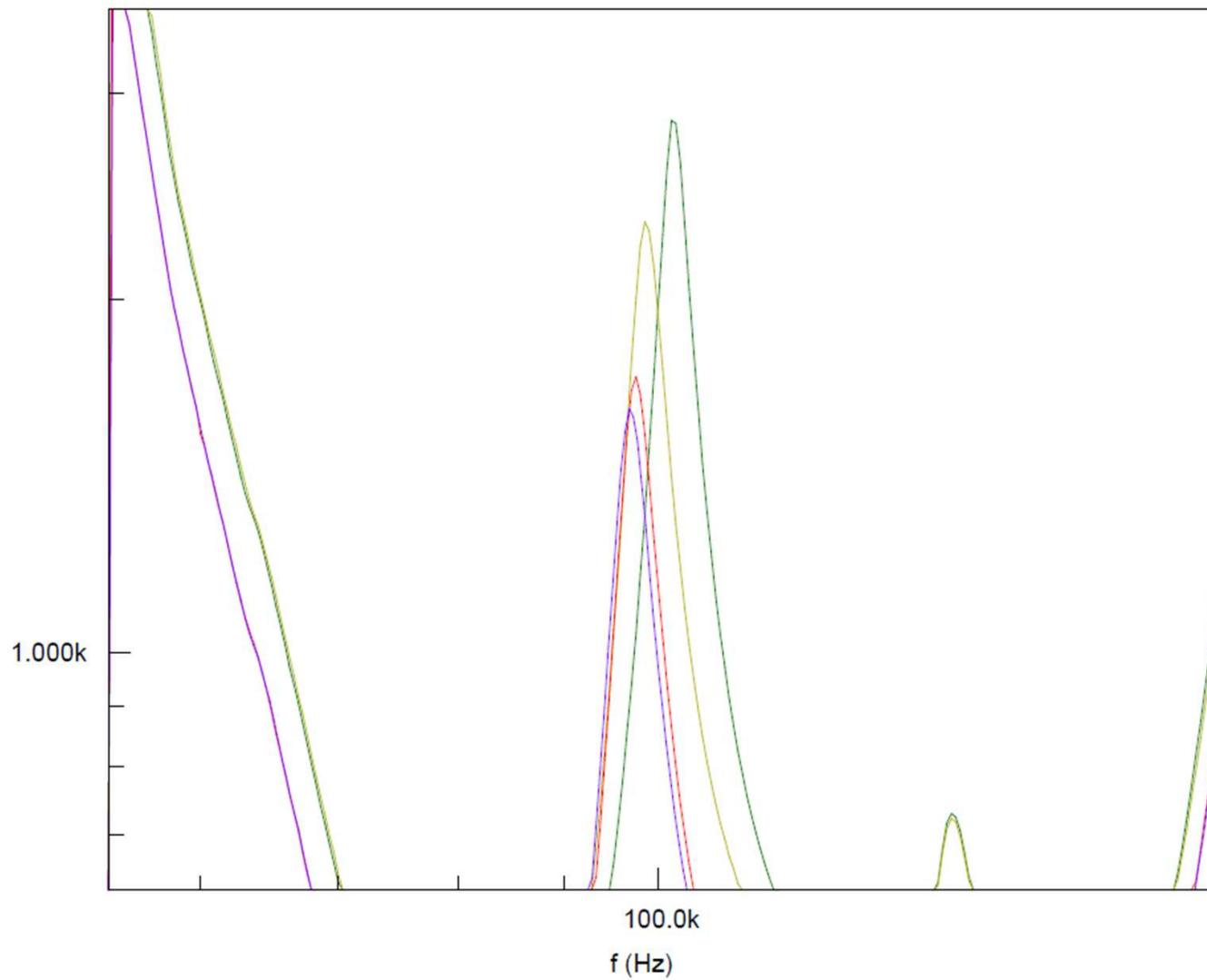


20 kV-os oldal c tekerecs (rövidrezárt, földelt primer) 2005. - 2015.



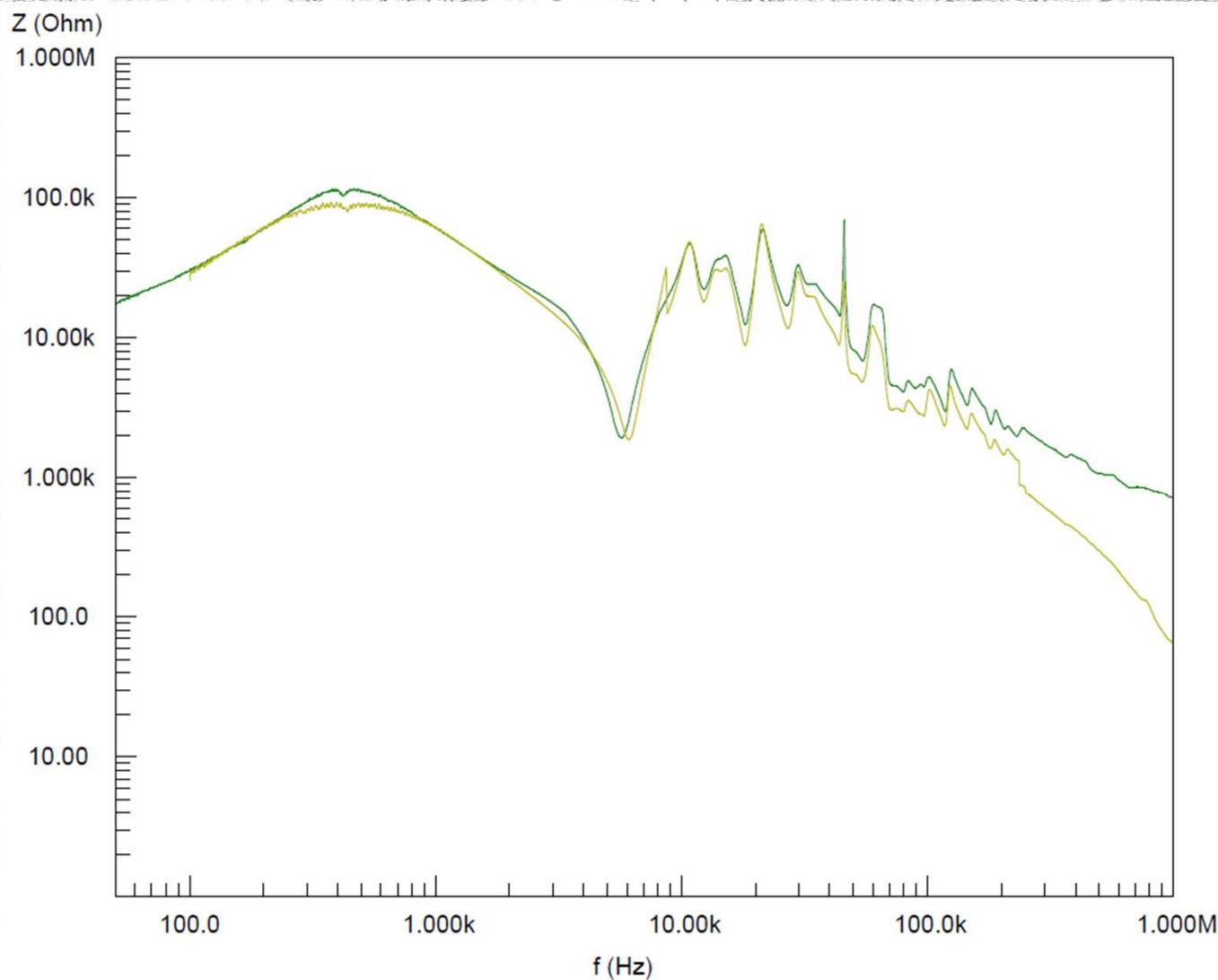
2005. - 2009. - 2015. - 2016.

Z (Ohm)



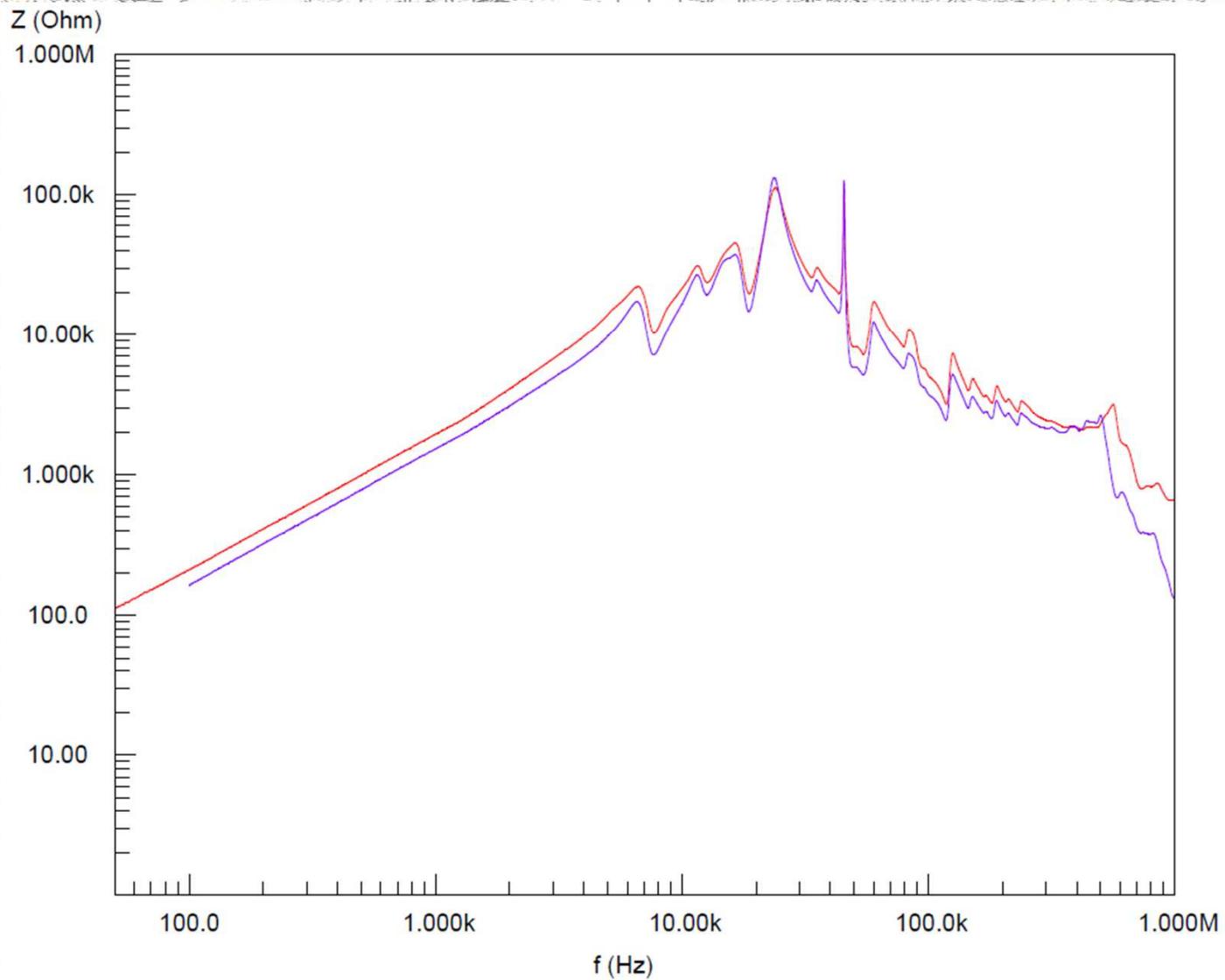
120/20 kV-os tr. A tekercs (szekunder oldal nyitott)

2011. - 2016.

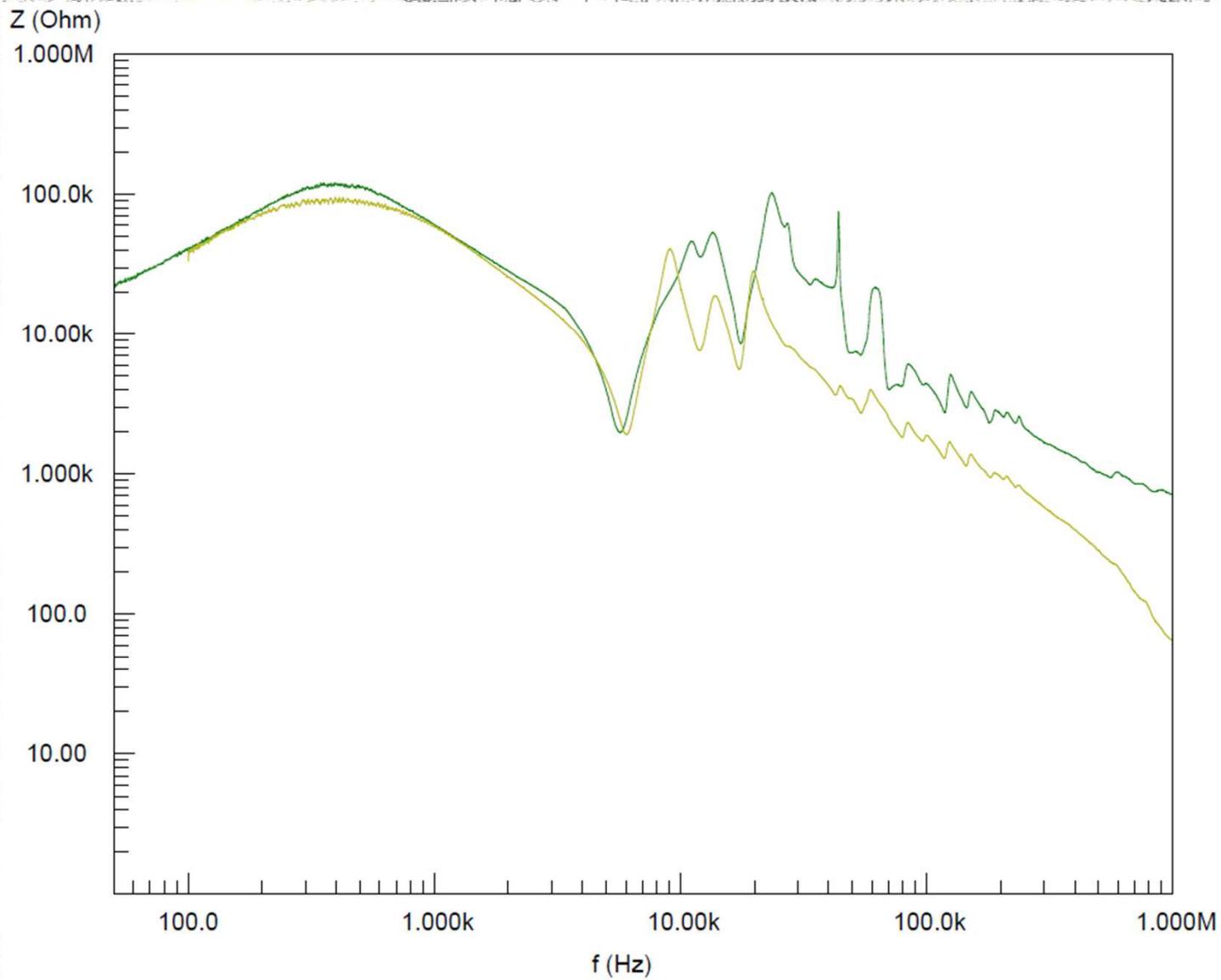


A tekercs (szekunder oldal rövidrezárva)

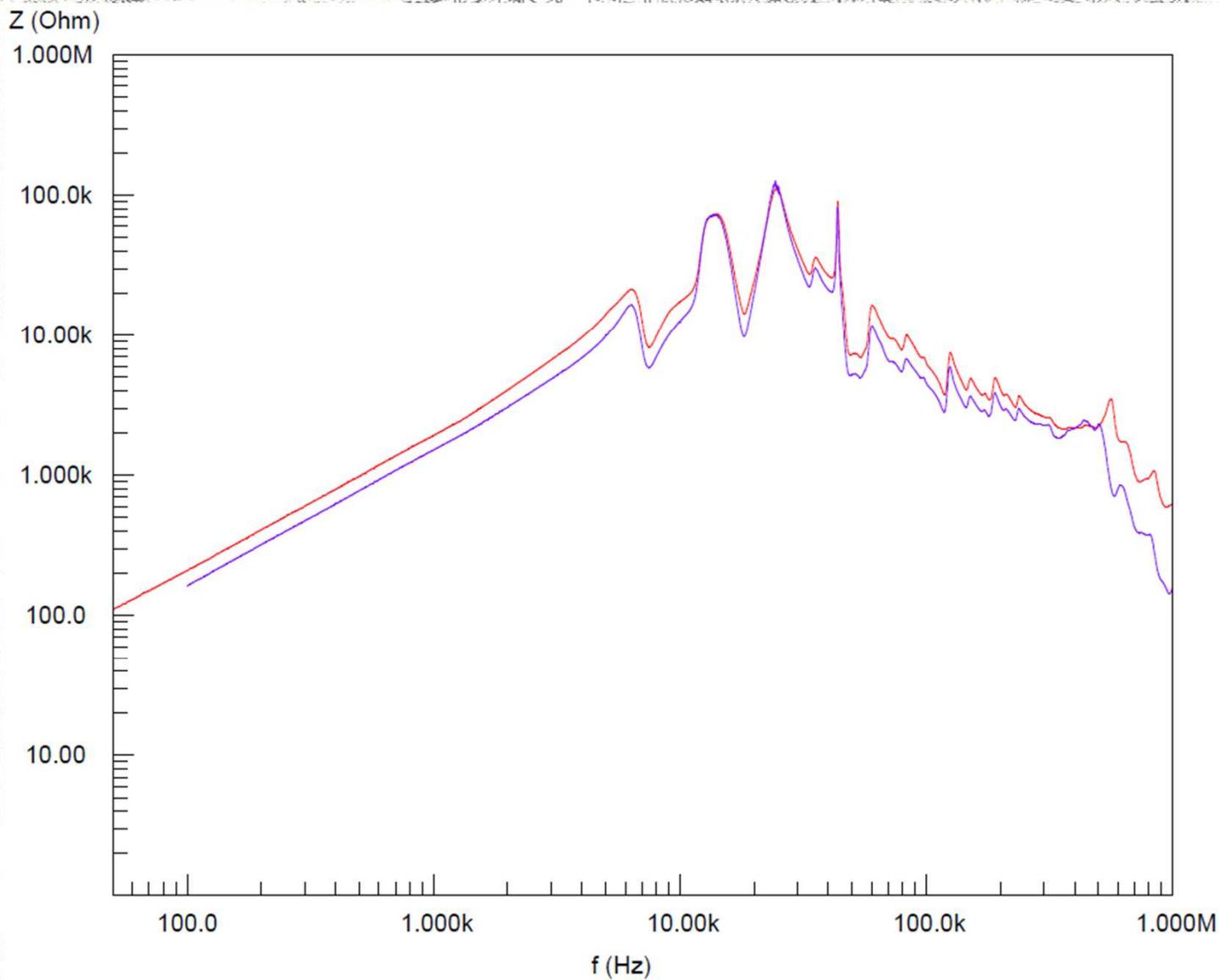
2011. - 2016.



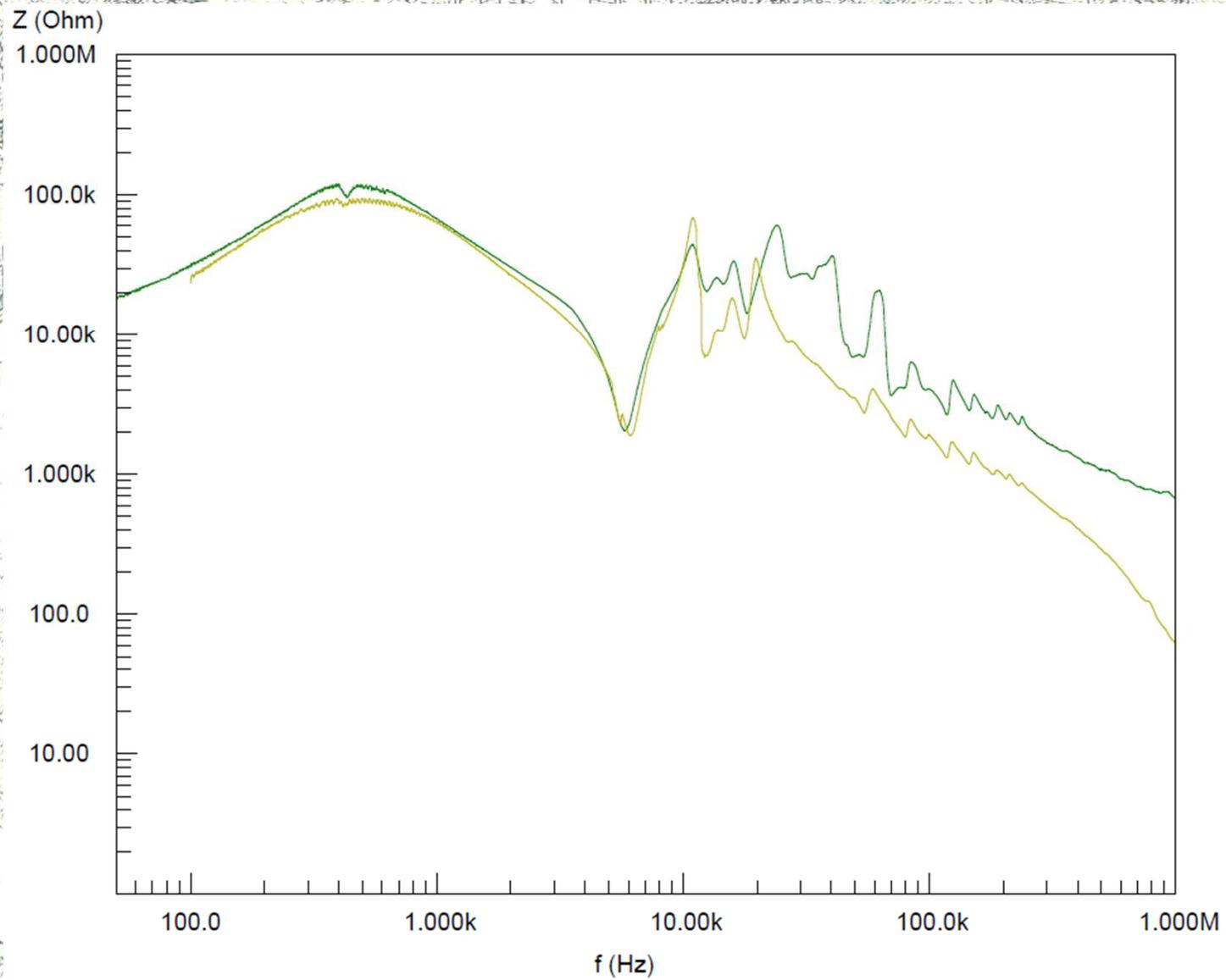
B tekercs (szekunder oldal nyitott) 2011. - 2016.



B tekercs (szekunder oldal rövidrezárva) 2011. - 2016.

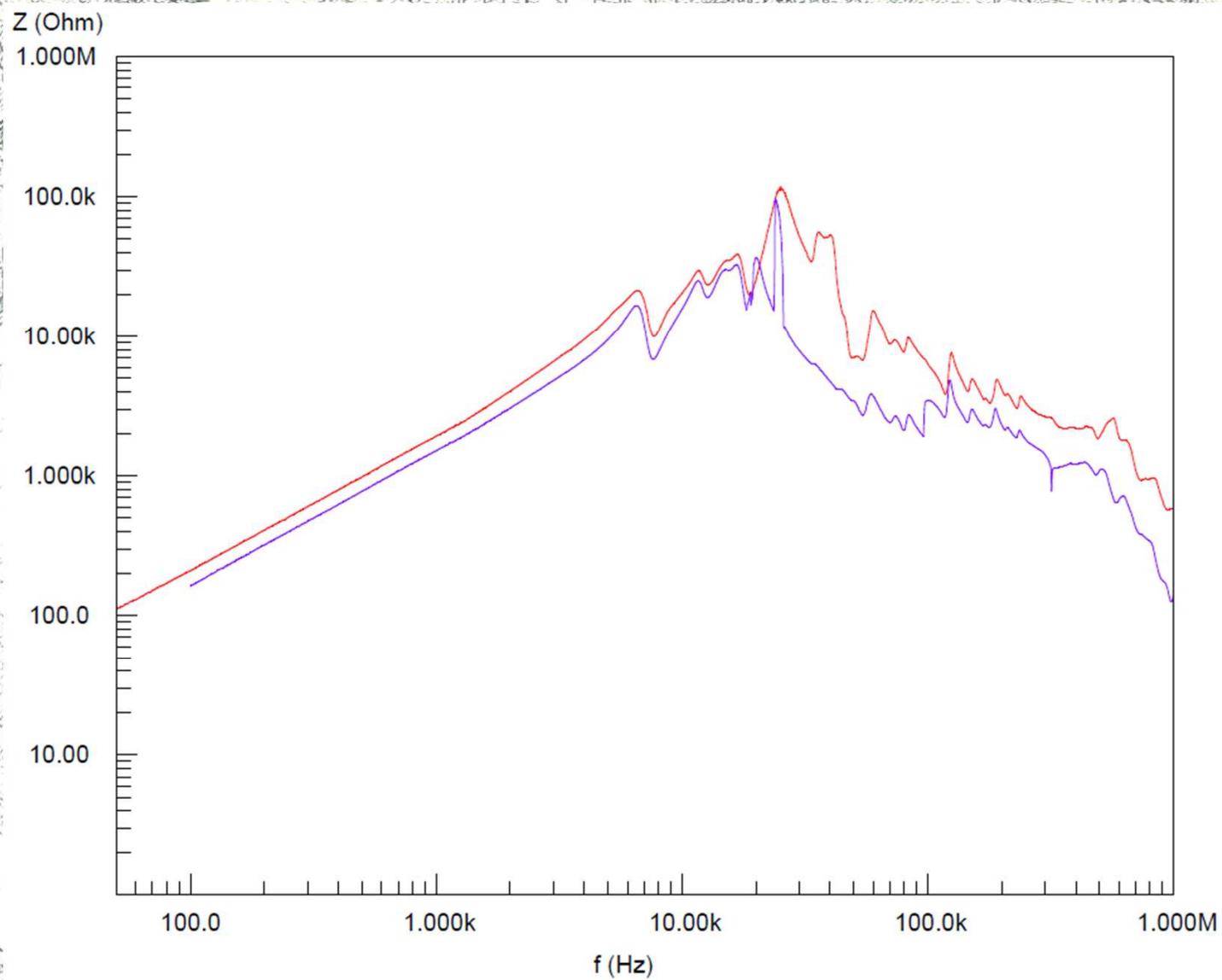


C tekercs (szekunder oldal nyitott) 2011. - 2016.



C tekercs (szekunder oldal rövidrezárva)

2011. - 2016.



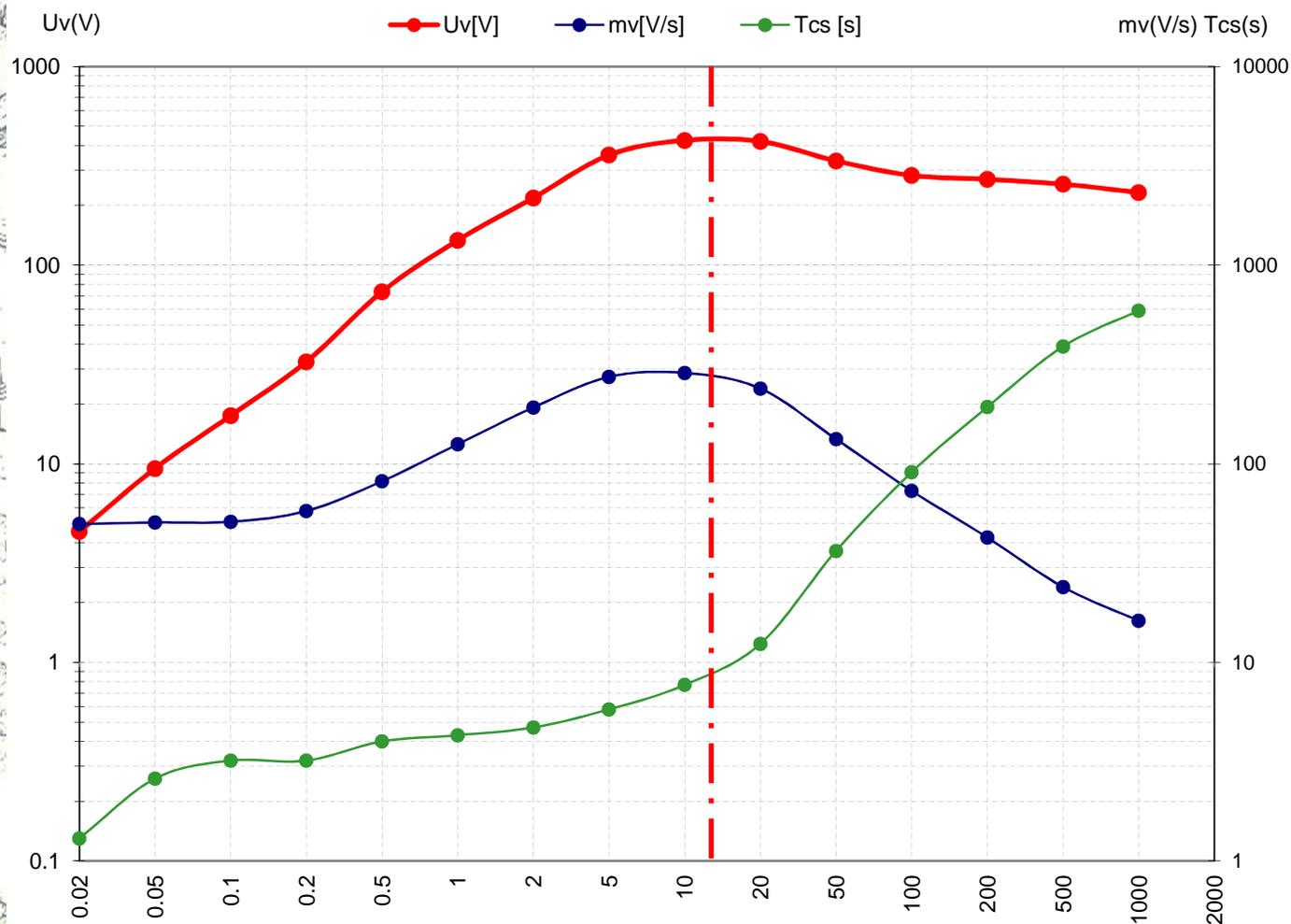
An aerial photograph of an industrial site, likely an oil refinery or processing plant. The central feature is a large, circular storage tank surrounded by a complex network of pipes, walkways, and smaller structures. The entire facility is enclosed by a perimeter fence. The background shows some greenery and other industrial buildings.

Polarizációs spektrum mérés

(olajregenerálás eredményének ellenőrzése)

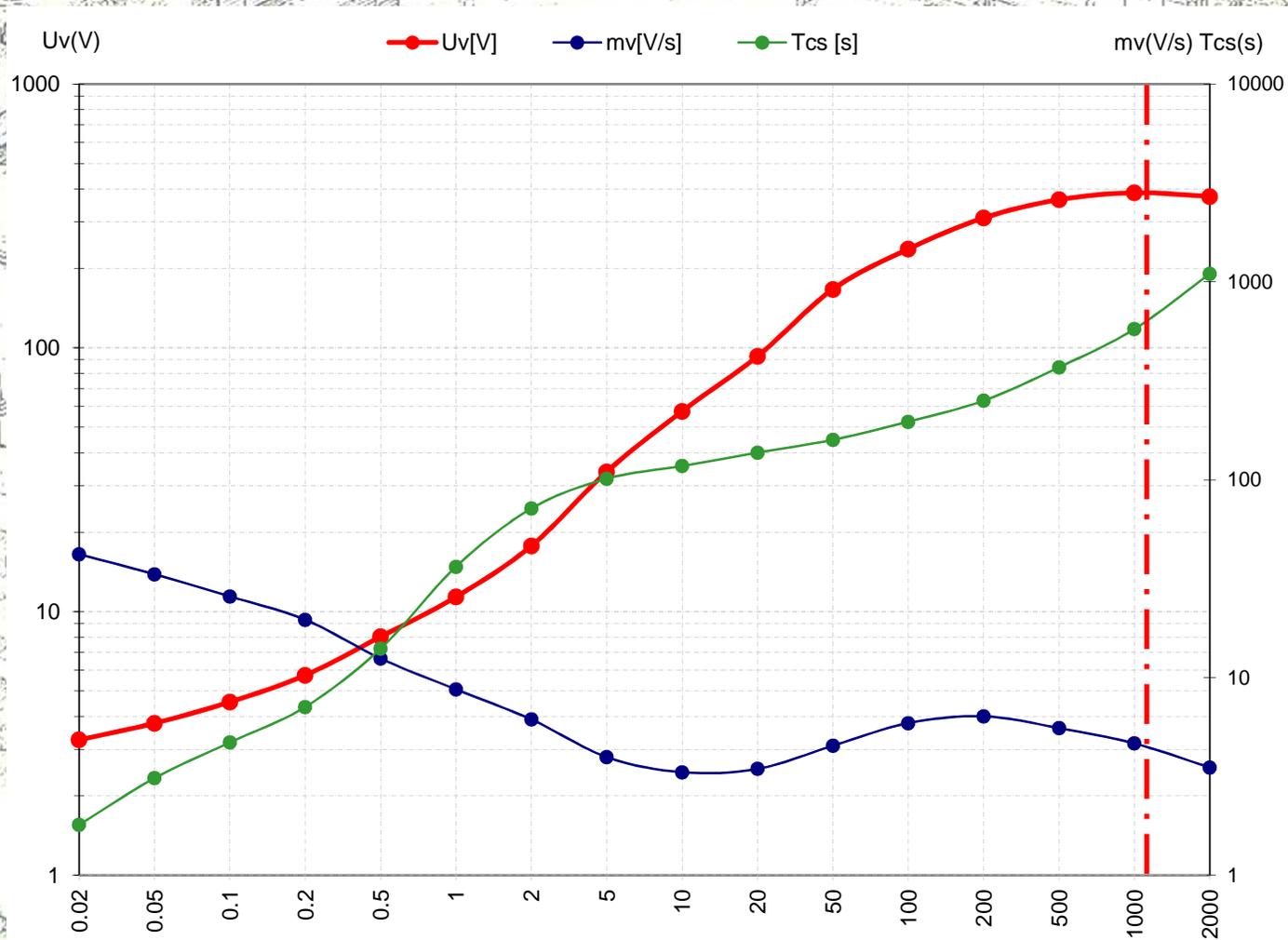
1992-ben gyártott 120/20 kV-os transzformátor Olajregenerálás regenerálás előtt

39 °C - τ_c 13 s - $\approx 2\%$
Primer - Föld (20 °C-ra): $R_{60} = 2.68 \text{ G}\Omega$



Regenerálás után 2,5 hónappal

28 °C - τ_c 1100 s - $\approx 0.7\%$
Primer - Föld (20 °C-ra): $R_{60} = 11.2 \text{ G}\Omega$





Egyéb. Érdekesség?

(hogy lesz a kisdologból nagydolog)

120/35 kV-os transzformátor



120 kV-os transzformátor átvezetőszigetelő robbanás











Köszönöm a figyelmet!

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