دستگاه جامع تست تجهیزات

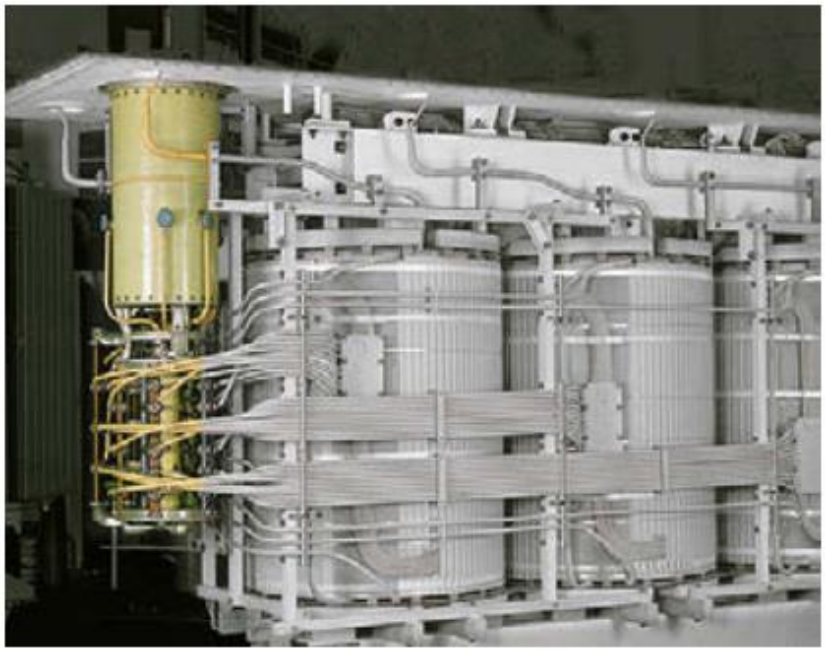
KAVOSH T22

گروه اسفا

Power Transformer Diagnostics

Power Transformer Diagnostics

Dynamic resistance of On Load Tap changers (OLTCs)



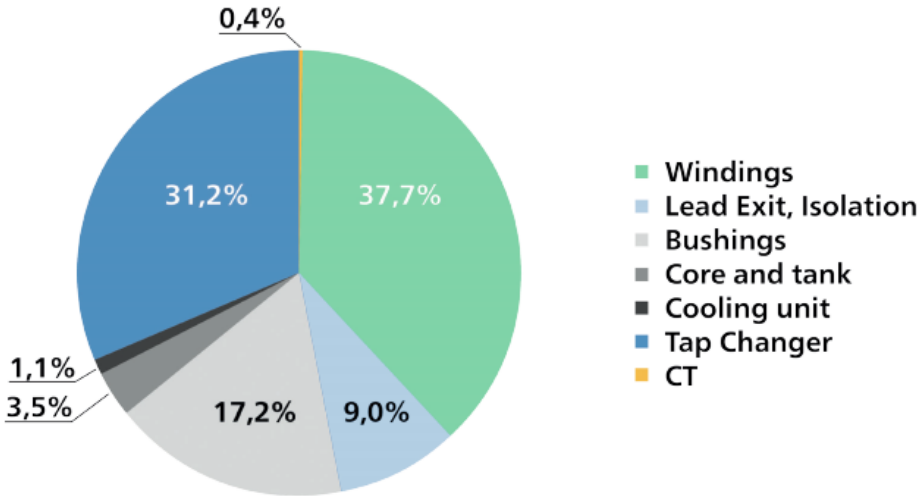


Figure 1. Failure location of substation transformers based on 536 failures [1]

Power Transformer Diagnostics

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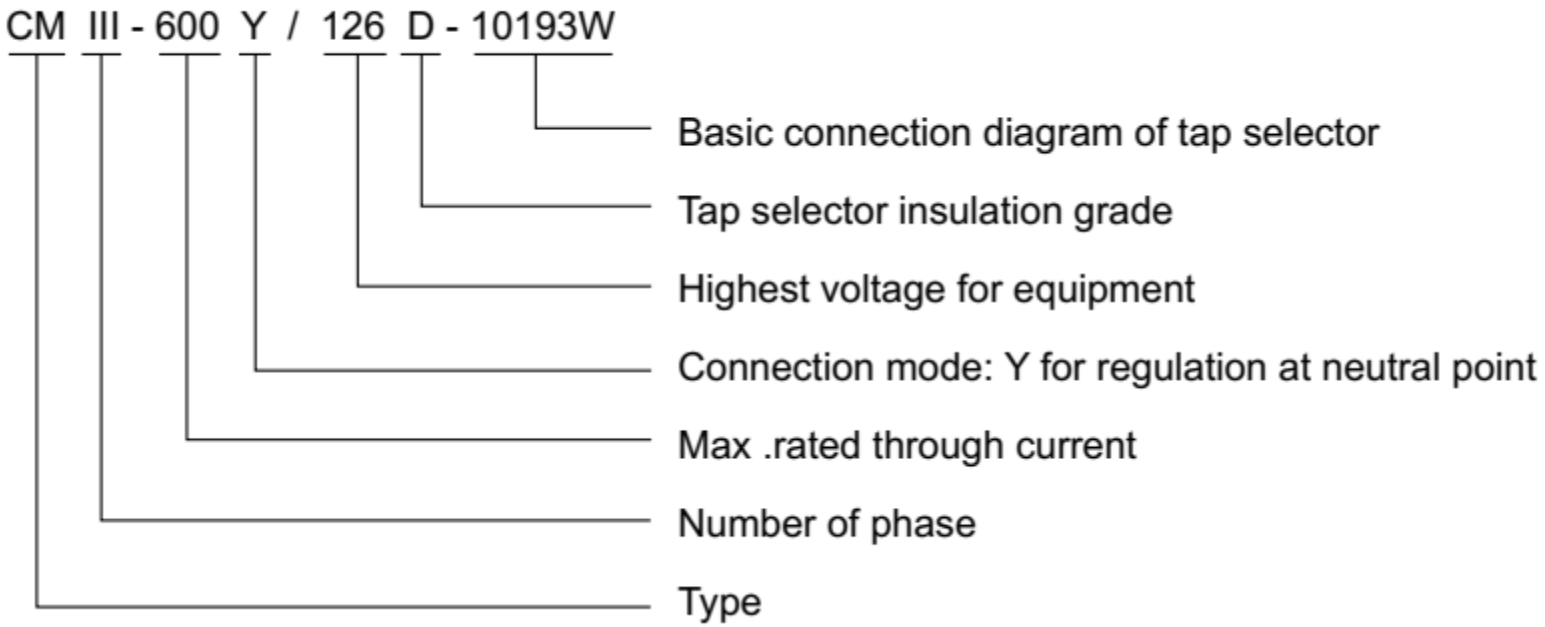


Power Transformer Diagnostics

Resistive Oil Type OLTC

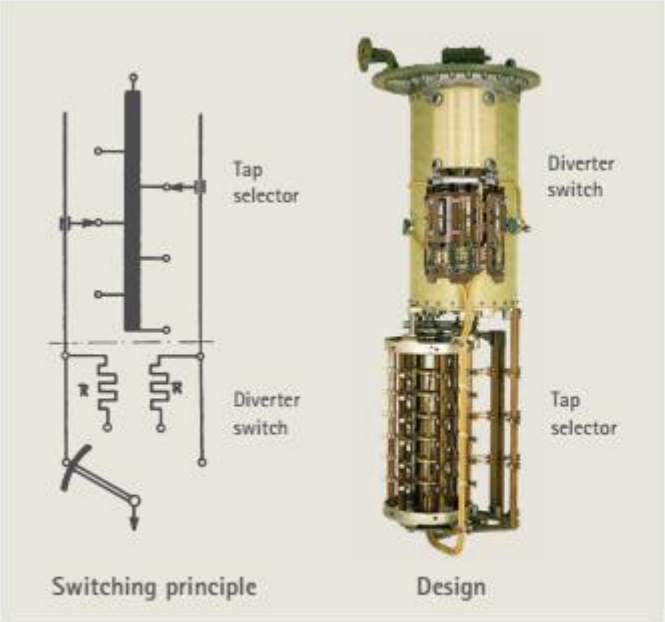


Fig. 11: Design principle – diverter switch (arcing switch) with tap selector OILTAP® M®

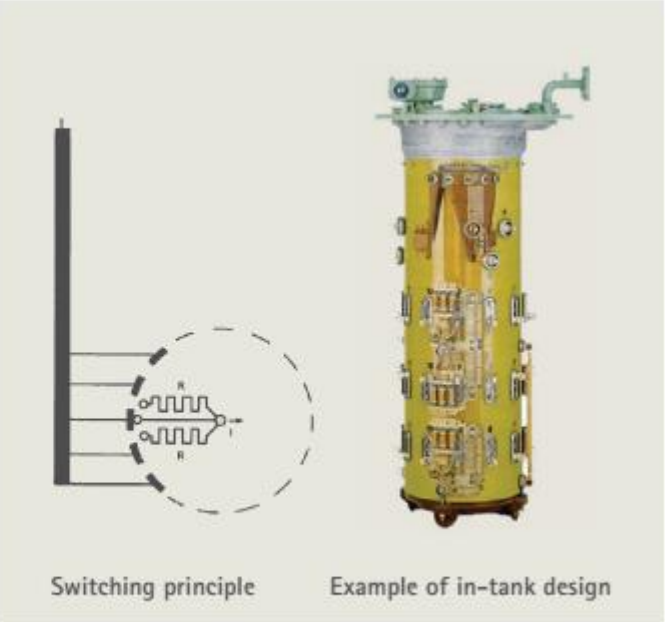


Fig. 13: Design principle – selector switch (arcing tap switch) OILTAP® V®

Power Transformer Diagnostics

Resistive Oil Type OLTC

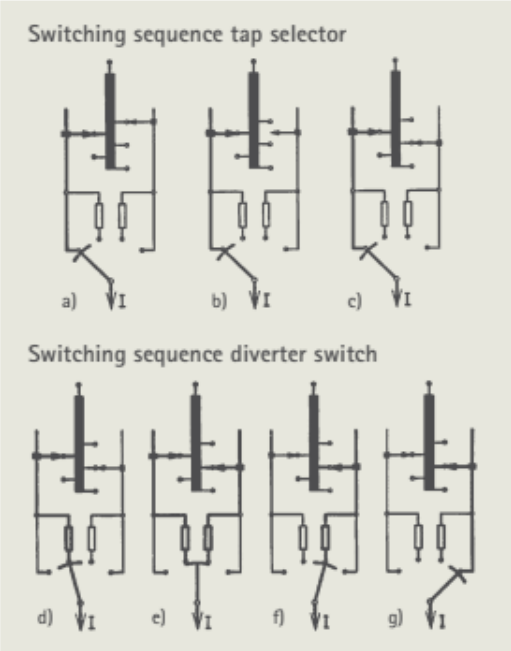


Fig. 12: Switching sequence of tap selector – diverter switch (arcing switch)

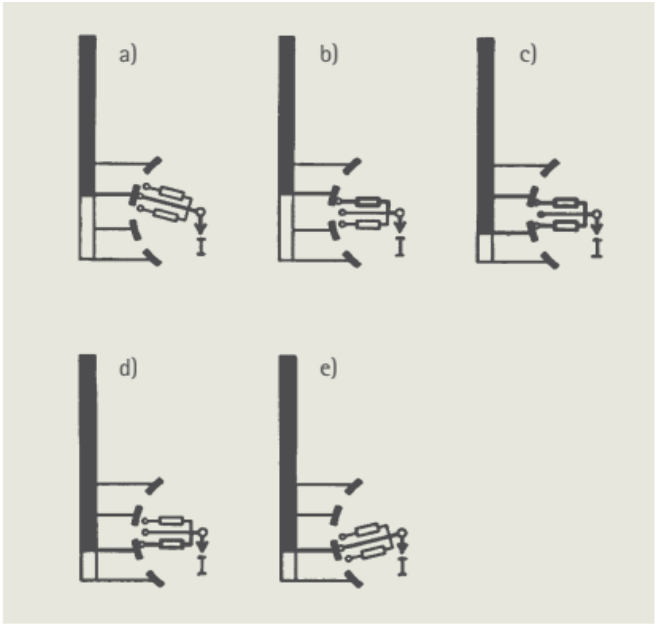
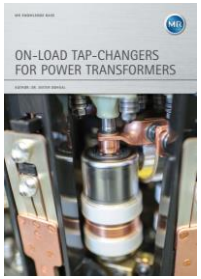


Fig. 14: Switching sequence of selector switch (arcing tap switch) OILTAP® V®



Power Transformer Diagnostics

Vacuum Type OLTC

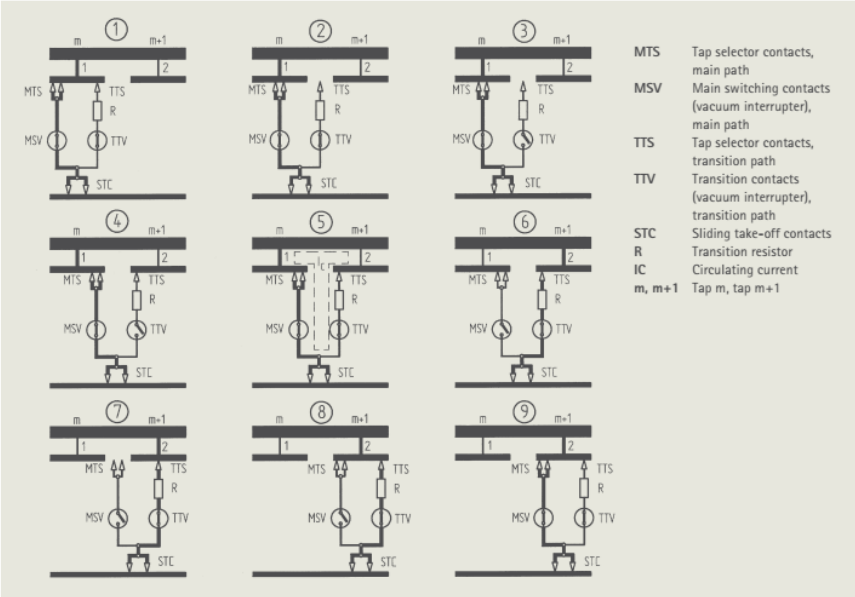


Fig. 28: Switching sequence of resistor type OLTC with the same vacuum interrupters for the closing and opening side of the diverter switch – VACUTAP® VV®

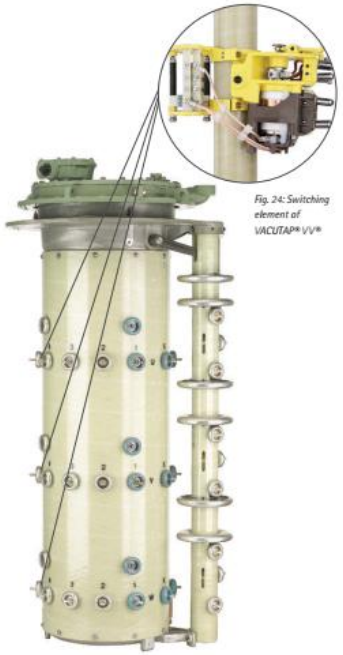


Fig. 24: Switching element of VACUTAP® VV®

Fig. 23: Resistor vacuum-type OLTC for in-tank installations in oil-filled power transformers – VACUTAP® VV® (up to 600 A)

Power Transformer Diagnostics

Dynamic resistance vs static resistance

Static winding resistance measurement: windings, internal connections from the bushing and the tap changer to the windings, tap selector contact, diverter switch main contact

Dynamic resistance measurement (DRM) of OLTC: measures the fast switching process of the diverter or selector switch (between 40 to 70 ms)

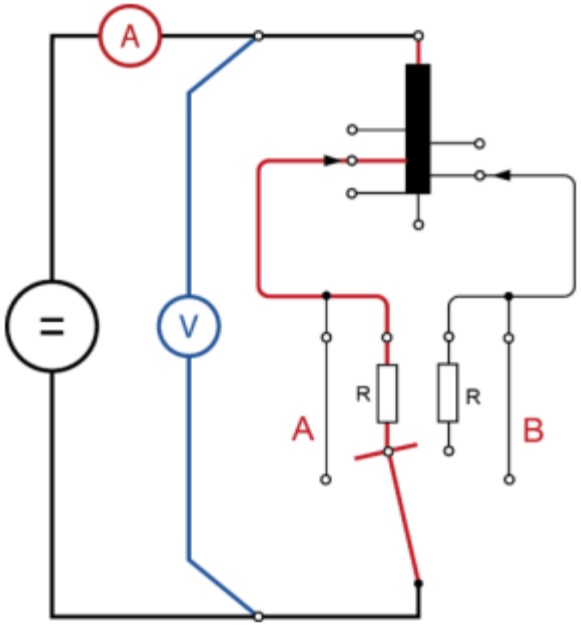
Power Transformer Diagnostics

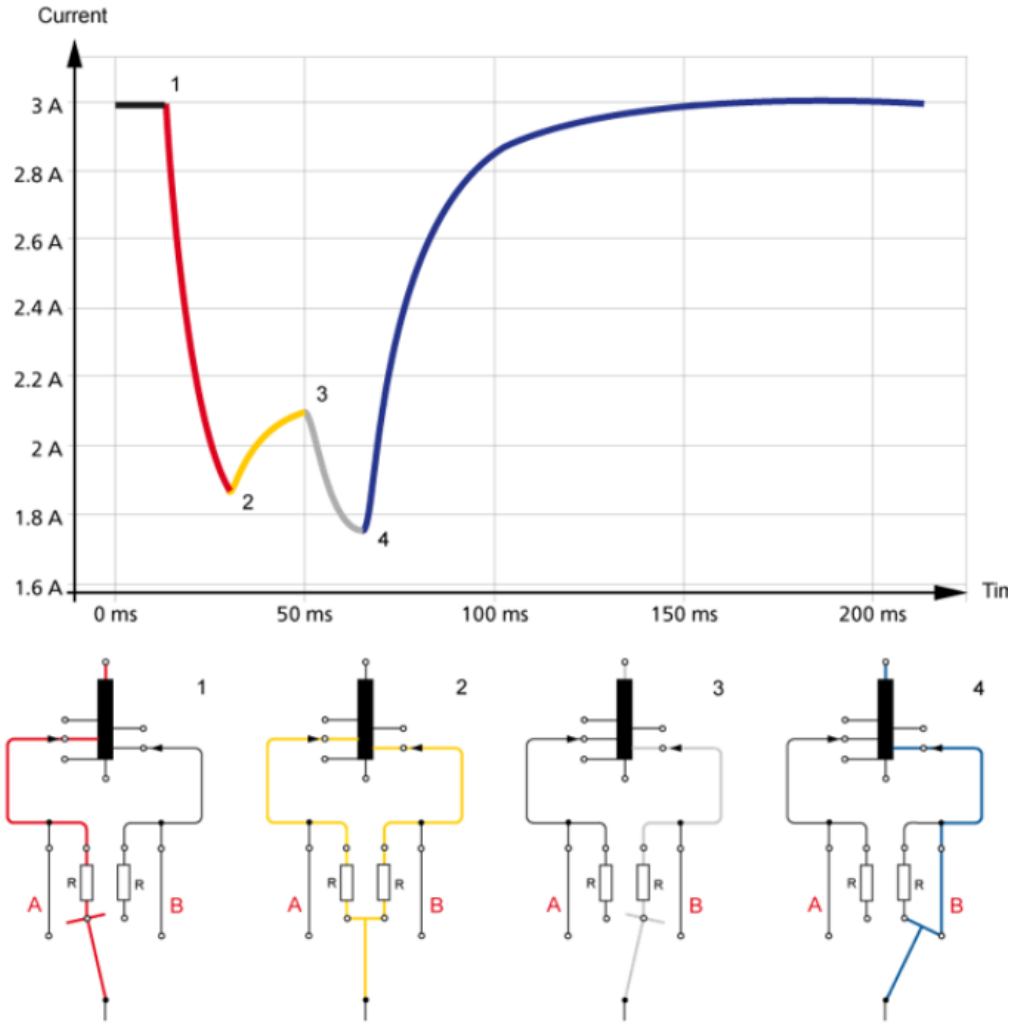
Measurement methods:

- Discontinuity detection
- Dynamic current (resistance) measurement

Power Transformer Diagnostics

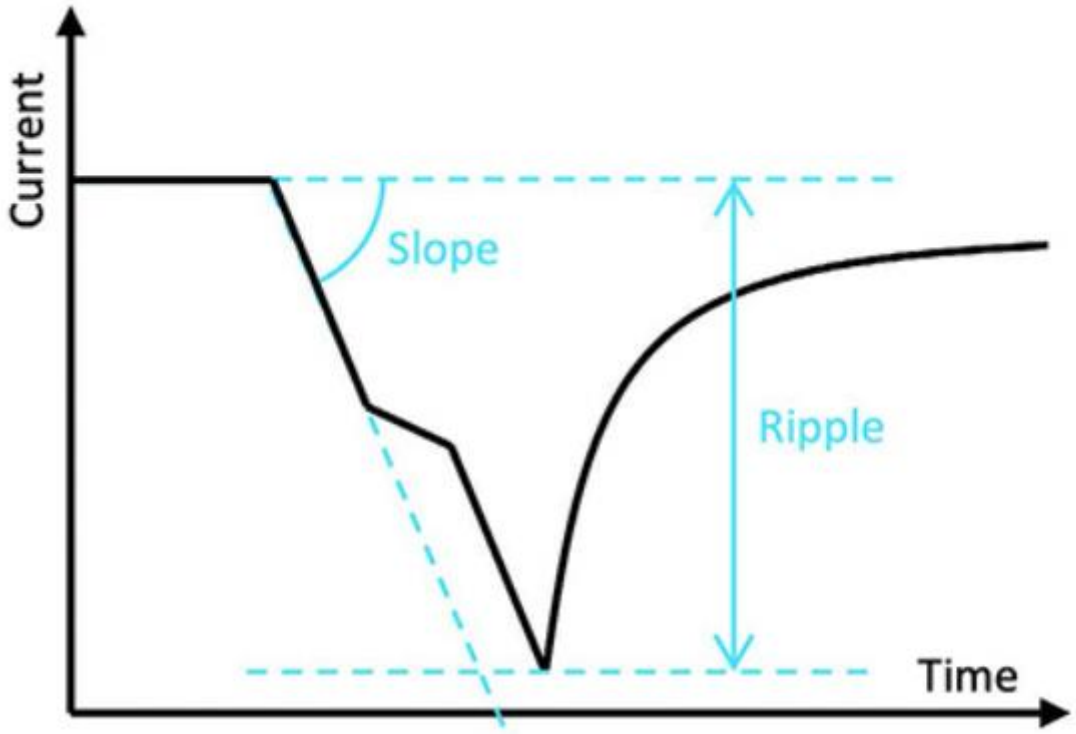
Measurement principle





Power Transformer Diagnostics

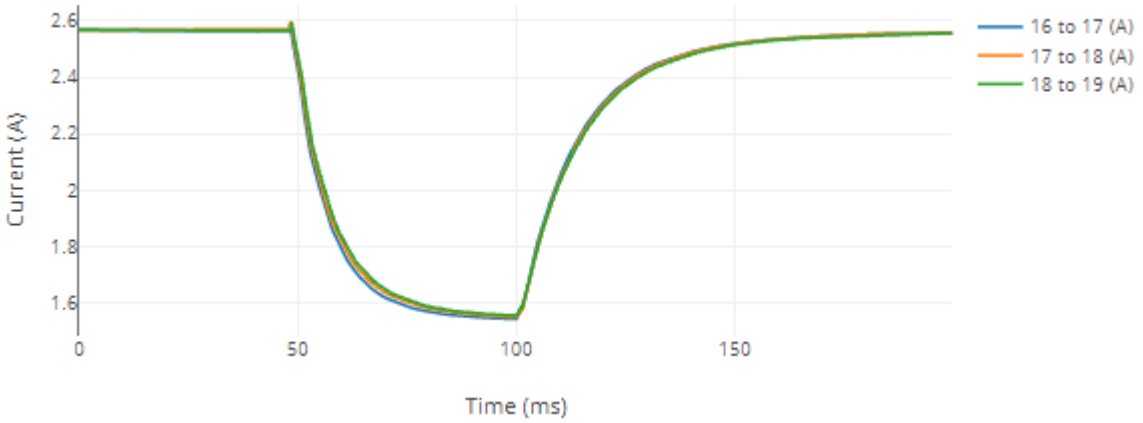
Ripple and Slope:



Power Transformer Diagnostics

OLTC DRM (Dynamic Resistance Measurement)

30MVA, 63/20kV, MR- VV, Iran Transfo

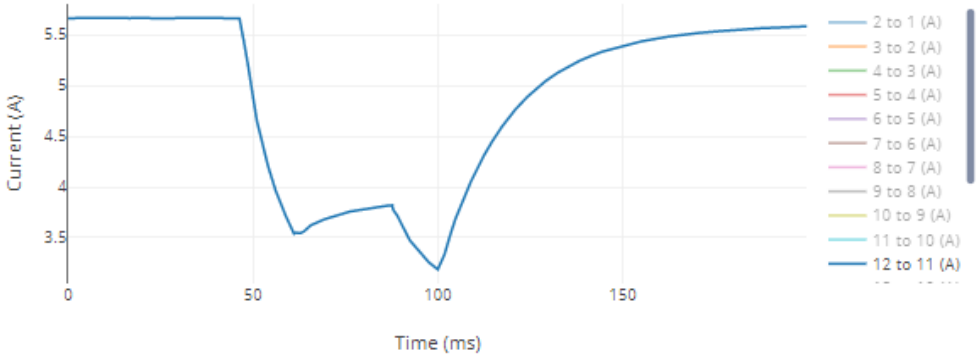


■	⇅	Phase	Tap	Ripple	Slope
☐	↓	A	17 to 16	40.65 %	87.42 A/s
☐	↓	A	18 to 17	40.49 %	84.77 A/s
☐	↓	A	19 to 18	40.50 %	81.72 A/s
☐	↑	A	16 to 17	39.83 %	83.35 A/s
☐	↑	A	17 to 18	39.58 %	80.61 A/s
☐	↑	A	18 to 19	39.34 %	77.19 A/s

Power Transformer Diagnostics

OLTC DRM (Dynamic Resistance Measurement)

22.5MVA, 63/20kV, ABB-UBB, Iran Transfo

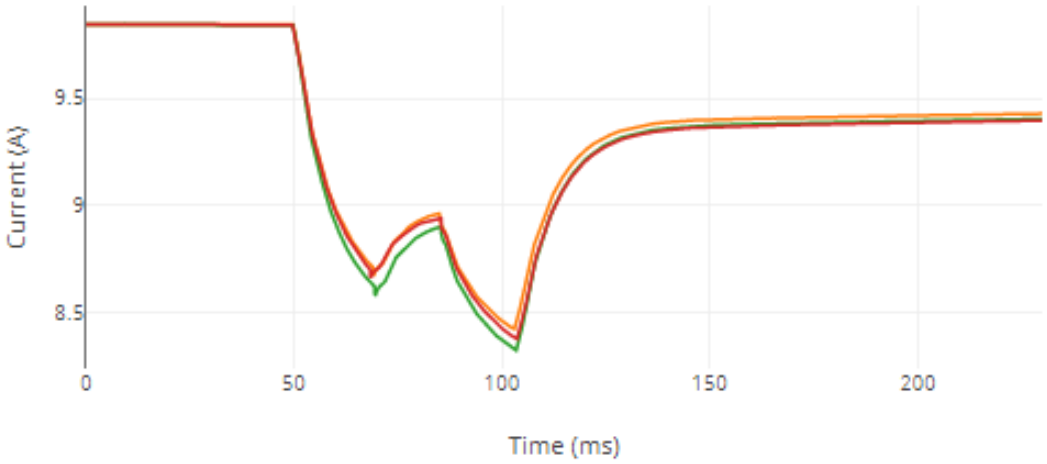


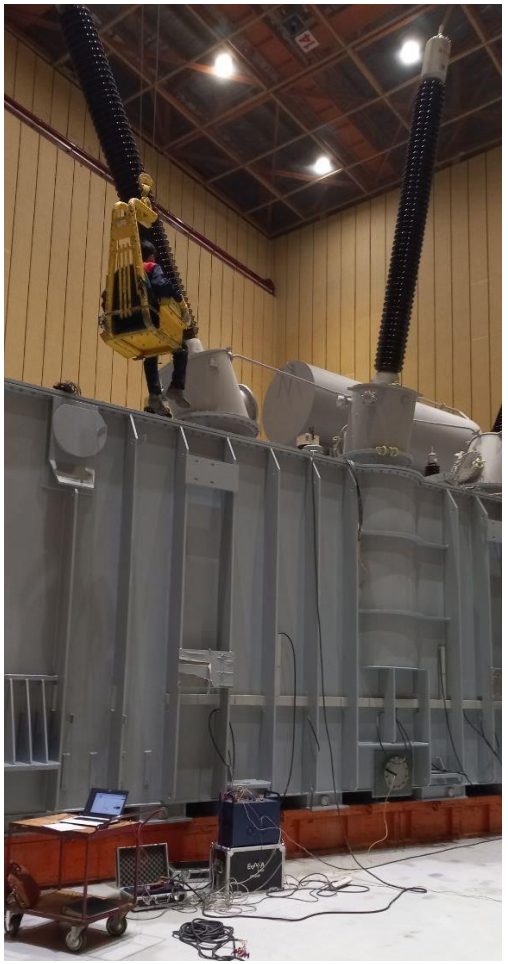
		Phase	Tap	Ripple	Slope
☐	↓	A	2 to 1	41.08 %	159.76 A/s
☐	↓	A	3 to 2	42.45 %	188.82 A/s
☐	↓	A	4 to 3	37.24 %	124.56 A/s
☐	↓	A	5 to 4	41.42 %	165.69 A/s
☐	↓	A	6 to 5	40.11 %	148.4 A/s
☐	↓	A	7 to 6	36.44 %	114.05 A/s
☐	↓	A	8 to 7	41.96 %	179.27 A/s
☐	↓	A	9 to 8	43.13 %	192.82 A/s
☐	↓	A	10 to 9	38.59 %	132.9 A/s
☐	↓	A	11 to 10	37.81 %	127.14 A/s
☐	↓	A	12 to 11	43.80 %	188.96 A/s
☐	↓	A	13 to 12	42.23 %	171.87 A/s
☐	↓	A	14 to 13	40.37 %	143.91 A/s
☐	↓	A	15 to 14	34.99 %	108.82 A/s
☐	↓	A	16 to 15	39.35 %	140.1 A/s
☐	↓	A	17 to 16	40.87 %	153.04 A/s
☐	↓	A	18 to 17	36.70 %	116.86 A/s
☐	↓	A	19 to 18	37.56 %	122.33 A/s

Power Transformer Diagnostics

OLTC DRM (Dynamic Resistance Measurement)

410MVA, 420/20kV, MR VMIII, Iran Transfo



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