Off-Load Tap Selection for a Target Secondary Voltage

Tap position on the HV winding to give a target secondary voltage under load from the actual supply voltage, tap step and range, and the resulting voltage.

Method: Turns-ratio adjustment by tapping

Input parameters

Unit system: SI

Parameter	Value	Unit
Rated primary voltage	11.000	kV
Rated secondary voltage (no load)	433.00	V
Actual primary voltage	10.500	kV
Target secondary voltage at load	415.00	V
Voltage regulation at the load	3.0000	%
Tap step	2.5000	%
Taps either side of nominal	2.0000	

Calculated results

Parameter	Value	Unit
Required tap (positive adds HV turns)	-3.3931	%
Selected tap position	-1.0000	
Resulting secondary voltage at load	411.20	V
Deviation from target	-0.91600	%

Notes for this case

• No-load secondary needed V_t/(1 − ε); ratio a = V_p/V_s0; tap = a/a_n − 1, rounded to the nearest step within ±n. Raising HV turns (positive tap) lowers the secondary voltage. Off-load tap changers must be moved de-energised; check light-load overvoltage after choosing a tap for full load.

Formula and method

$$a_{req} = \frac{V_p(1-\varepsilon)}{V_t}, \quad t_{req} = \frac{a_{req}}{a_n} - 1, \quad V_s = \frac{V_p(1-\varepsilon)}{a_n(1+ks)}$$

Variables

V_{pn}	Rated primary voltage	V
V_{sn}	Rated secondary voltage (no load)	V
V_p	Actual primary voltage	V
V_t	Target secondary voltage at load	V
ε	Voltage regulation at the load	-
s	Tap step	-
n	Taps either side of nominal	-
t_{req}	Required tap (positive adds HV turns)	-
k	Selected tap position	-
V_s	Resulting secondary voltage at load	V
$\Delta V/V_t$	Deviation from target	-

Method and standards

Tap selection.

Assumptions and limits

- Taps on HV winding; constant regulation.

References

Turns-ratio adjustment by tapping

Report details

Report reference	FCC-98K6-AQ6J (the same inputs always give the same reference)
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Calculator	Off-Load Tap Selection for a Target Secondary Voltage
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Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/transformers/transformer-tap-selection

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.