Flicker: Voltage Change of a Load Step and Short-Term Severity Pst

Relative voltage change at the supply point from a repeated load step and the short-term flicker severity Pst by the analytical (flicker-time) method.

Method: Analytical flicker evaluation (flicker impression time)

Input parameters

Unit system: SI

Parameter	Value	Unit
Short-circuit power at the supply point	50.000	MVA
Source X/R ratio	5.0000	
Nominal line voltage	11.000	kV
Active power step	400.00	kW
Reactive power step	900.00	kvar
Voltage changes per minute	2.0000	
Shape factor (1 for rectangular steps)	1.0000	

Calculated results

Parameter	Value	Unit
Relative voltage change	1.9219	%
Flicker impression time per change	18.608	s
Short-term flicker severity	0.86135	

Notes for this case

• d ≈ (ΔP·R + ΔQ·X)/V²; t_f = 2.3(F·d[%])^3.2 s per change; P_st = (Σt_f/600 s)^(1/3.2) over 10 minutes. P_st = 1 is the conventional threshold of irritability. The analytical method suits regular steps; arc furnaces and welders need a flickermeter or measured data.

Formula and method

$$d = \frac{\Delta P R + \Delta Q X}{V^2}, \quad t_f = 2.3(Fd)^{3.2}, \quad P_{st} = \left(\frac{\sum t_f}{T_p}\right)^{1/3.2}$$

Variables

S_{sc}	Short-circuit power at the supply point	VA
X/R	Source X/R ratio	-
V	Nominal line voltage	V
ΔP	Active power step	W
ΔQ	Reactive power step	var
r	Voltage changes per minute	-
F	Shape factor (1 for rectangular steps)	-
d	Relative voltage change	-
t_f	Flicker impression time per change	s
P_{st}	Short-term flicker severity	-

Method and standards

Flicker.

Assumptions and limits

- Rectangular or equivalent steps; analytical method range.

References

Analytical flicker evaluation (flicker impression time)

Report details

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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/power-quality/flicker-voltage-change-pst

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.