

MYRON ZUCKER

IEEE Std. 519™-2014 is a standard developed for utility companies and their customers in order to limit harmonic content and provide all users with better power quality. Some of the key areas of the standard are detailed in the following tables.

Bear in mind that dealing with harmonics may still be required, whether or not the goal is to meet IEEE 519 standards. In low-voltage systems (600 V or less), capacitors are typically the lowest impedance at harmonic frequencies, and experience very high RMS currents and increased heat which causes them to fail.

TABLE 1 – VOLTAGE DISTORTION LIMITS

Bus voltage V at PCC*	Individual harmonic (%)	Total harmonic distortion THD (%)
$V \leq 1.0$ kV	5.0	8.0
1 kV < $V \leq 69$ kV	3.0	5.0
69 kV < $V \leq 161$ kV	1.5	2.5
161 kV < V	1.0	1.5 ¹

¹High-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal whose effects will have attenuated at points in the network where future users may be connected.

TABLE 2 – MAXIMUM HARMONIC CURRENT DISTORTION IN PERCENT OF I_L
Individual harmonic order (odd harmonics)^{1, 2}

I_{SC}/I_L	$3 \leq h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h < 50$	TDD
< 20 ³	4.0	2.0	1.5	0.6	0.3	5.0
20 < 50	7.0	3.5	2.5	1.0	0.5	8.0
50 < 100	10.0	4.5	4.0	1.5	0.7	12.0
100 < 1000	12.0	5.5	5.0	2.0	1.0	15.0
> 1000	15.0	7.0	6.0	2.5	1.4	20.0

¹Even harmonics are limited to 25% of the odd harmonic limits above.
²Current distortions that result in a dc offset, e.g., half-wave converters, are not allowed.
³All power generation equipment is limited to these values of current distortion, regardless of actual I_{SC}/I_L , where
 I_{SC} = maximum short-circuit current at PCC
 I_L = maximum demand load current (fundamental frequency component) at the PCC under normal load operating conditions

TABLE 3 – LOW-VOLTAGE SYSTEM CLASSIFICATION AND DISTORTION LIMITS

	Special applications¹	General system	Dedicated system²
Notch depth	10%	20%	50%
Notch area (A_N) ^{3, 4}	16400	22800	36500

¹Special applications include hospitals and airports.
²A dedicated system exclusively supplies a specific user or user load.
³In volt-microseconds at rated voltage and current.
⁴The values for A_N have been developed for 480 V systems. It is necessary to multiply the values given by V/480 for application at all other voltages.

*PCC is Point of Common Coupling

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