

IEEE 519 and the Australian Standards for Electromagnetic Compatibility (EMC)

What is IEEE 519?

The IEEE is the Institute of Electrical and Electronics Engineers.

IEEE 519 is a document that was initially published in 1981 titled "Recommended Practices and Requirements for Harmonic Control in Electric Power Systems". The document established levels of voltage distortion acceptable to the distribution system and has been widely applied in establishing needed harmonic correction throughout the electrical power industry.

However with the increase in industrial usage of adjustable speed drives, rectifiers, and other non-linear loads, it became apparent that a rewrite of IEEE 519, treating the relationship of harmonic voltages to the harmonic currents flowing within industrial plants, was necessary to support control of harmonic voltages.

The new IEEE 519, published in 1992, sets forth limits for both harmonic voltages on the utility transmission and distribution system and harmonic currents within the industrial distribution systems. Since harmonic voltages are generated by the passage of harmonic currents through distribution system impedances, by controlling the currents or system impedances within the industrial facility, one can control harmonic voltages on the utility distribution.

The table below is Table 10-3 of IEEE Std 519-1992 and provides guidance for Total Demand Distortion in electrical systems.

IEEE Recommended Practices & Requirements for Harmonic Control in Electrical Power Systems

ISC/IL	<11	11≤h<17	17≤h<23	23≤h<35	35≤h	Total Demand Distortion
<20*	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

Please note:

- Current Distortion Limits for General Distribution Systems (120V through 69,000V)
- Maximum Harmonic Current Distortion in Percent of I L
- Individual Harmonic Order (Odd Harmonics)
- Even harmonics are limited to 25% of the odd harmonic limits above.
- Current distortions that result in a dc offset, e.g. half-wave converters, are not allowed.
- All power generation equipment is limited to these values of current distortion, regardless of actual ISC/IL (ISC = maximum short-circuit current at PCC; IL = maximum demand load current, fundamental frequency component, at PCC).

What are the Australian Standards for Electromagnetic Compatibility (EMC)?

The relevant standard for electromagnetic compatibility (EMC) voltage distortion in Australia is AS/NZS 61000.3.6:2001 and it is compatible with the IEEE 519 recommendations.

If the supply authority is unsatisfied with the degree of voltage distortion at the point of common coupling (pcc), harmonic filtering may be specified to comply with the Australian Standards.

Please refer to the table below for details about AS/NZS 61000.3.6:2001:

Odd harmonics Non-multiples of 3		Odd harmonics Multiples of 3 (triplens)		Even harmonics	
Order, h	% harmonic voltage	Order, h	% harmonic voltage	Order, h	%harmonic voltage
5	5	3	5	2	2
7	5	9	1.5	4	1
11	3.5	15	0.3	6	0.5
13	3	21	0.2	8	0.5
17	2	>21	0.2	10	0.5
19	1.5			12	0.2
23	1.5			>12	0.2
25	1.5				
>25	0.2 + 1.1(25/h)				

NOTE: total harmonic distortion (TDHV) 8% max