ANSI/AHRI Standard 1211 (SI) with Addenda 1 and 2

2011 Standard for

Performance Rating of Variable Frequency Drives

Approved American National Standard

ANSI

Approved by ANSI on April 17, 2012

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ANSI/AHRI STANDARD 1211 (SI)-2011 WITH ADDENDUM 2

Performance Rating of Variable Frequency Drives
June 2015

Addendum 2 (dated March 2015) of ANSI/AHRI Standard 1211 (SI)-2011, "*Changes to ANSI/AHRI Standard 1211 (SI)-2011"* is provided as follows. The following changes have been incorporated (deletions are shown by ~~strikethroughs~~, additions are shown by shading) into the already published 2011 version of ANSI/AHRI Standard 1211 (SI) to avoid confusion:

The changes include:

1. Revision to Section 5.1.9.1.

5.1.9.1 The Total Harmonic Distortion (THD) shall be calculated as follows:

$$THD = \sqrt{\sum_{n=2}^{40\,50}\left(\frac{X_n}{X_1}\right)^2} \qquad 1$$

2. Added Section 5.1.9.5.

5.1.9.5 The System Losses of the Drive System Efficiency shall be calculated as follows:

System Losses (%) = 100% - Drive System Efficiency (%) 5

3. Revision to Sections 6.4.1 and 6.4.2.

6.4.1 *Drive System Efficiency*. The System Losses of the measured ~~drive system efficiency~~ Drive System Efficiency of any manufactured unit shall not be greater than 120% of the System Losses of the published Drive System Efficiency in percent (For example, if published Drive System Efficiency is 90%, the System Losses of the published Drive System Efficiency is 10% as determined from Equation 5. The measured Drive System Efficiency cannot be less than 88% or the System Losses of the measured Drive System Efficiency cannot be greater than 12%).

6.4.2 *Motor Insulation Stress.* ~~The Motor Insulation Stress test shall meet the insulation system test requirements and qualification tests per IEC Standard 60034-18-42, Sections 7, 8, 9 and 10.~~ The measured Peak Voltage of any manufactured unit shall not be more than 10% higher than the certified Peak Voltage and the measured Voltage Rise Time of any manufactured unit shall not be less than 0.03 µsec compared to the certified Voltage Rise Time (For example, if published rating of Peak Voltage is 1,000v, the measured cannot exceed 1,100v. If the published rating of Voltage Rise Time is 0.10µsec, the measured cannot be less than 0.07µsec).

4. Revision to Appendix C4.1.

C4.1 *Electrical Measuring Instruments.* For the drive system efficiency and power line harmonics tests, the instruments shall have an accuracy of ± 0.2% of full scale at the fundamental supply source frequency and shall be capable of measuring current, voltage and real power at least up to the ~~40~~50th harmonic of

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fundamental supply source frequency and shall be designed as per IEC Standard 61000-4-7. When more than one instrument is required to measure a parameter, accuracy of each individual instrument shall be multiplied together to calculate the total accuracy for this specific measurement. Moreover, in addition to these requirements, for the motor insulation stress test, the instruments shall be capable of measuring the peak voltage and the VFD DC bus voltage with an accuracy of ± 1 % and the Voltage Rise Time with an accuracy of ± 10 %.

5. Revised Table 5 to update 40th Harmonic to 50th Harmonic.

Table 5. Reported Harmonic Current								
Size, hp	Reported R_{SCE}	Reported Individual Harmonic Current[1], I_n/I_1 [a] (%) at 100% Load(%)						Reported Harmonic Current Distortion Factors, (%) up to ~~40~~50th Harmonic
		~~I_3~~	I_5	I_7	~~I_9~~	I_{11}	I_{13}	*THD*
Note 1: Report individual harmonic current (A) arithmetic average value based on the three line currents.								

Note: This addendum is not ANSI approved but will be submitted to ANSI for approval.

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ANSI/AHRI STANDARD 1211 (SI)-2011 WITH ADDENDUM 1

Performance Rating of Variable Frequency Drives
June 2013

Addendum 1 (dated June 2013) of ANSI/AHRI Standard 1211 (SI)-2011, *"Changes to ANSI/AHRI Standard 1211 (SI)-2011"* is provided as follows. The following changes have been incorporated (deletions are shown by ~~strikethroughs~~, additions are shown by shading) into the already published 2011 version of ANSI/AHRI Standard 1211 (SI) to avoid confusion:

Note: This addendum was approved by ANSI on October 1, 2013.

The changes include:

1. Remove 16% from Table 3 and replace with 25% to align with values in Table 2.

Table 3. Speed/Torque Test Points for Powerline Harmonics Test

		Percent Torque		
		~~16%~~25%	56%	100%
Percent Speed	40%			CT
	50%	VT		CT
	75%		VT	CT
	100%			CT/VT

Notes:
1. Output frequency or other readouts from the VFD shall not be used to determine percent speed.

2. Only those cells that contain CT or VT are test points

2. Remove I_3 and I_9 from Table 5 and add units of amps for current in Table 5.

Table 5. Reported Harmonic Current

Size (hp)	Reported R_{SCE}	Reported Individual Harmonic Current[1], I_n/I_1[a] (%) at 100% Load(%)						Reported Harmonic Current Distortion Factors, (%) up to 40th Harmonic
		~~I_3~~	I_5	I_7	~~I_9~~	I_{11}	I_{13}	*THD*
Note 1: Report individual harmonic current (A) arithmetic average value based on the three line currents.								

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IMPORTANT

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AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

AHRI uses its best efforts to develop standards/guidelines employing state-of-the-art and accepted industry practices. AHRI does not certify or guarantee that any tests conducted under its standards/guidelines will be non-hazardous or free from risk.

Note:

This is a new standard.

This standard seeks to provide an uniform method of measuring and comparing Variable Frequency Drives by establishing testing and rating requirements; specifically data requirements for Drive System Efficiency, Power Line Harmonics and Motor Insulation Stress.

For I-P ratings, see ANSI/AHRI Standard 1210 (I-P)-2011

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