

Energy efficiency test methods for small motors



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Update No. 1

C747-09

August 2016

Note: For information about the **Standards Update Service**, go to shop.csa.ca or e-mail techsupport@csagroup.org.

Title: Energy efficiency test methods for small motors — originally published October 2009

The following revisions have been formally approved:

Revised	CSA C747 Sample electric motor efficiency test report (Excel spreadsheet)
New	None
Deleted	None

C747-09 Errata summary for Spreadsheet

The following changes have been incorporated into the spreadsheet to correspond with the requirements of the standard.

- In CSA C747, Clause 6.7.5: The test shall be considered invalid if the dynamometer correction factor (absolute value) is greater than 5% of the full-load torque of the motor under test. The link has been changed to reflect the change of the $T_{2offset}$ cell in the formula.
- The power factor calculations have been changed for the small three-phase motors (seldom tested but allowed in the standard) that was only calculated for single-phase motors. See the cells that are affected by the changes in red color:

Efficiency =	[(2.07 + -0.03 - 0.00) / (9549 x 1.029)] x 3531.65 = 73.1%		
	[(1.55 + -0.03 - 0.00) / (9549 x 0.806)] x 3550.15 = 69.9%		
	[(1.03 + -0.03 - 0.00) / (9549 x 0.616)] x 3563.35 = 60.6%		
	[(0.52 + -0.03 - 0.00) / (9549 x 0.424)] x 3580.7 = 42.9%		
	X axis		
	Y axis		
% Nominal power	Corrected output power	h	Power factor
101%	0.752 (kW)	1.01 (HP)	73.1% 92.2%
76%	0.564 (kW)	0.76 (HP)	69.9% 88.8%
50%	0.373 (kW)	0.50 (HP)	60.6% 82.8%
24%	0.182 (kW)	0.24 (HP)	42.9% 70.5%

where

T_{NLC} = measured no-load motor torque with dynamometer coupled, N•m (see Clause 6.7.3)

$T_{NLC\ corrected} = Slope \times (P_{NLC} - P_{NLU})$

where

$Slope = (T_{LLP} - T_{NLC}) / (P_{LLP} - P_{NLC})$

- A few cosmetic changes including, masking cells and formulas, hiding some lines, adding new messages to the user and reducing the number of significant digits.

Standards Update Service

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Technical Committee on Industrial Equipment

M. Dudar	Manitoba Hydro, Winnipeg, Manitoba	<i>Chair</i>
D. Wiegand	D.A. Wiegand Transformer Engineering Services, London, Ontario	<i>Vice-Chair</i>
T. Brennan	Natural Resources Canada, Ottawa, Ontario	
D. Cane	Caneta Research, Mississauga, Ontario	<i>Associate</i>
A. Cinicolo	Canadian Electricity Association, Ottawa, Ontario	<i>Associate</i>
A. Cordova	V.J. Pamensky Canada Incorporated, Toronto, Ontario	
D. Dederer	Enertech Solutions Inc., Stouffville, Ontario	<i>Associate</i>
D. Delaney	General Electric Company, Fort Wayne, Indiana, USA	
P.S. dos Santos	WEG Equipamentos Elétricos, Jaragua Do Sul, Brazil	
K. Elsey	Canadian Energy Efficiency Alliance, Mississauga, Ontario	
D. Friesen	Manitoba Hydro, Winnipeg, Manitoba	<i>Associate</i>
P. Goulet	Hydro-Québec, Montréal, Québec	<i>Associate</i>
E. Grzesik	Ontario Ministry of Energy, Toronto, Ontario	
D. Henrique	Henriques Consulting, Richmond, British Columbia	<i>Associate</i>
T. Kimmis	Saskatchewan Research Council, Saskatoon, Saskatchewan	<i>Associate</i>
D. Li	CSA International, Toronto, Ontario	<i>Associate</i>
J. Neu	Electro-Federation Canada, Toronto, Ontario	

V. Nielsen	Nielsen Engineering, Meaford, Ontario	
T. Rodrigues	Technical Standards & Safety Authority, Mississauga, Ontario	
D. Sharkey	Tecumseh, Ontario	<i>Associate</i>
E. St-Cyr	Hydro-Québec, Montréal, Québec	
S. Stricker	Stricker Associates Inc., Richmond Hill, Ontario	
K. Veerman	FortisBC Inc., Kelowna, British Columbia	<i>Associate</i>
G. Verrall	Allied Controls Limited, Burnaby, British Columbia	
M. Zeller	BC Hydro, Burnaby, British Columbia	
J.L. Hernandez	Canadian Standards Association, Mississauga, Ontario	<i>Project Manager</i>

Subcommittee on Performance of Small Motors

D. Friesen	Manitoba Hydro, Winnipeg, Manitoba	<i>Chair</i>
M. Zeller	BC Hydro, Burnaby, British Columbia	
K. Amrane	Air-Conditioning, Heating and Refrigeration Institute, Arlington, Virginia, USA	
P. Angers	LTE-Hydro-Québec, Shawinigan, Québec	
J. Barth	A.O. Smith Electrical Products Company, Tipp City, Ohio, USA	
J. Boivin	CSA International, Pointe-Claire, Québec	
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T. Brennan	Natural Resources Canada, Ottawa, Ontario	
D. Dederer	Enertech Solutions Inc., Stouffville, Ontario	
D. Delaney	General Electric Company, Fort Wayne, Indiana, USA	
P. dos Santos	WEG Equipamentos Eletricos S.A., Motores, Jaraguá Do Sul, Brazil	
D. Eisenbraun	Emerson Motor Company, a Division of Emerson Electric Company, St. Louis, Missouri, USA	
E. Grzesik	Ontario Ministry of Energy, Toronto, Ontario	
A. Hauer	ebm-papst Inc., Farmington, Connecticut, USA	
J. Hodge	Toronto, Ontario	
V. John	ebm-papst Inc., Farmington, Connecticut, USA	

C. Keyes	Kinetrics Inc., Toronto, Ontario	
D. Knowles	Air-Conditioning, Heating and Refrigeration Institute, Arlington, Virginia, USA	
A. Kruuv	Madison Industrial Equipment Inc., Mississauga, Ontario	
L. Murray	Emerson Motor Company, a Division of Emerson Electric Company, St. Louis, Missouri, USA	
V. Nielsen	Nielsen Engineering, Meaford, Ontario	
S. Paulsen	New Brunswick Department of Public Safety, Fredericton, New Brunswick	
C. Pitis	BC Hydro, Burnaby, British Columbia	
H. Prosper	Natural Resources Canada, Ottawa, Ontario	
D. Stafford	Leeson Canada Inc., Hanover, Ontario	
R. Steffen	GE Commercial Motors by Regal-Beloit, Fort Wayne, Indiana, USA	
S. Stricker	Stricker Associates Inc., Richmond Hill, Ontario	
T. Young	Regal-Beloit Electric Motors, Inc., Fort Wayne, Indiana, USA	
D. Zambrano	Emerson Motor Technologies, a Division of Emerson Electric Company, Apodaca, Mexico	
J.L. Hernandez	Canadian Standards Association, Mississauga, Ontario	<i>Project Manager</i>

Preface

This is the second edition of CSA C747, *Energy efficiency test methods for small motors*. It supersedes the previous edition, published in 1994 under the title *Energy Efficiency Test Methods for Single- and Three-Phase Small Motors*.

Changes in this edition include

- (a) clarification of the testing methodology;
- (b) revised requirements for the accuracy of testing equipment;
- (c) inclusion of measurement uncertainties; and
- (d) inclusion of a reporting chart.

CSA acknowledges that the development of this Standard was made possible, in part, by the financial support of BC Hydro, Manitoba Hydro, Hydro-Québec, Natural Resources Canada, Canadian Electricity Association, Ontario Ministry of Energy, and Ontario Power Authority.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Subcommittee on Performance of Small Motors, under the jurisdiction of the Technical Committee on Industrial Equipment and the Strategic Steering Committee on Performance, Energy Efficiency, and Renewables, and has been formally approved by the Technical Committee. It will be submitted to the Standards Council of Canada for approval as a National Standard of Canada.

October 2009

Notes:

- (1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
- (2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
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 - (b) *provide an explanation of circumstances surrounding the actual field condition; and*
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C747-09

Energy efficiency test methods for small motors

1 Scope

1.1

This Standard specifies the test methods to be used in measuring the energy efficiency of small direct-current (dc) and single- and three-phase alternating-current (ac) rotating motors. This Standard includes the following motor types:

- (a) capacitor, permanent-split;
- (b) capacitor, capacitor-start or capacitor-run;
- (c) split phase;
- (d) split phase start, capacitor-run;
- (e) shaded pole;
- (f) reluctance;
- (g) polyphase induction;
- (h) dc*;
- (i) permanent magnet*;
- (j) brushless dc*;
- (k) inverter driven*.

*See [Clause 4](#).

1.2

This Standard applies to

- (a) dc and three-phase ac motors with output power rated greater than or equal to 0.186 kW and less than 0.746 kW at 1800 RPM (or equivalent*); and

**Equivalent is defined as a motor with the same torque output but with different kilowatt output and speed.*

- (b) single-phase ac motors rated greater than or equal to 0.186 kW.

The test method specified in this Standard may be applied to smaller motors.

1.3

This Standard specifies quoting methods and allowable tolerances on nominal efficiency values.

1.4

This Standard applies only to motors rated as continuous duty.

1.5

SI units of measurement should be used in the application of this Standard; however, other units may be used for testing provided that they are used consistently.

1.6

In CSA Standards, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; “may” is used to express an option or that which is permissible within the limits of the standard; and “can” is used to express possibility or capability. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is