



Cool Time Constant Calculations

GE Power Management No. GET-8420

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DESCRIPTION

The Cool Time Constant may be calculated from the actual cool time. The actual cool time (t) decays exponentially at the rate dependent on the time constant (τ). A larger value for τ gives longer cool time.

The Thermal Capacity Used after time t is given by:

$$TC_{used} = (TC_{used_start} - TC_{used_end})e^{-t/\tau} + TC_{used_end} \quad (Eq\ 1)$$

where: TC_{used_start} = TC at the start of the cooling period

TC_{used_end} = minimum running TC dictated by the hot/cold ratio or 0 for a stopped motor.

EXAMPLE

When to find this info on motor datasheet?

Calculate the stopped cool time constant for a motor that requires 3 hours cooling after being stopped just after a second start. The motor data allows two cold starts.

Permission of only two cold (0% TC) starts indicate that the motor thermal limit (100% TC) is reached after two starts.

It implies that one start requires 50% TC. To allow another start the relay must grant permission when TC falls below 50% and the programmed time constant ensures that this happens after 3 hours has lapsed

Substituting this information into Equation 1, we have:

$$\begin{aligned} TC_{used} &= (TC_{used_start} - TC_{used_end})e^{-t/\tau} + TC_{used_end} \\ &\Rightarrow 50\% = (100\% - 0\%)e^{-180 \text{ min}/\tau} + 0\% \\ &\Rightarrow \tau = 260 \text{ minutes} \end{aligned} \quad (Eq\ 2)$$

Therefore, the required Cool Time Constant is 260 minutes (or 15600 seconds).

Entered cool time constant will ensure proper start inhibit time for motor to cool.

How do I perform the same calculation for after the motor has been running and is above ambient temperature?

TOSHIBA INTERNATIONAL CORPORATION
Industrial Division / Houston Motor Plant

SQUIRREL CAGE INDUCTION MOTOR
PERFORMANCE SPECIFICATIONS

INDEX	MPCF-1033
SHEET NO.	1 of 1
ISSUED	11/08/96
SUPERSEDES	10/06/95
REVISION	1
WRITTEN BY	R. EVANS
APPROVED BY	<i>Joy Hughes</i>

CUSTOMER: REDMOND WALTZ
TIC SR No.: 138391

MOTOR NAMEPLATE DATA

H.P.: 300	VOLTS: 4000	3 PH / 60 Hz	S. RPM: 1800
FRAME: N449T	ENCL: TEFC	FLAMPS: 41	FLRPM: 1785
FORM: FCGL1	S.F.: 1.15	NEMA DESIGN: A	INSUL CLASS: F
TYPE: TIKK	AMB.: 40°C	CODE: G	DUTY:
MODEL No.: 4DL300L1DKEDHH		KW: -	
NOM. EFF.: -	MIN. EFF.: -	P.F.: -	

AMPERAGE	TORQUES	**BEARINGS:
LOCKED ROTOR: 256	FULL LOAD (lb-ft.): 883 LOCKED ROTOR (%): 225 BREAK DOWN (%): 255	DRIVE END: OPPOSITE DRIVE END:

EFFICIENCY	POWER FACTOR
FULL LOAD: 95.8 3/4 LOAD: 94.9 1/2 LOAD: 92.7	FULL LOAD: 81.7 3/4 LOAD: 77.5 1/2 LOAD: 68.1

ALL CHARACTERISTICS ARE AVERAGE EXPECTED VALUES BASED UPON RATED VOLTAGE,
FREQUENCY AND SINWAVE POWER INPUT.

* TEMPERATURE RISE WILL BE CONSISTENT WITH INSULATION, AMBIENT AND SERVICE FACTOR AS
DEFINED BY NEMA-MG-12.43 OR -20.40.

** BEARINGS ARE THE ONLY RECOMMENDED SPARE PART(S).

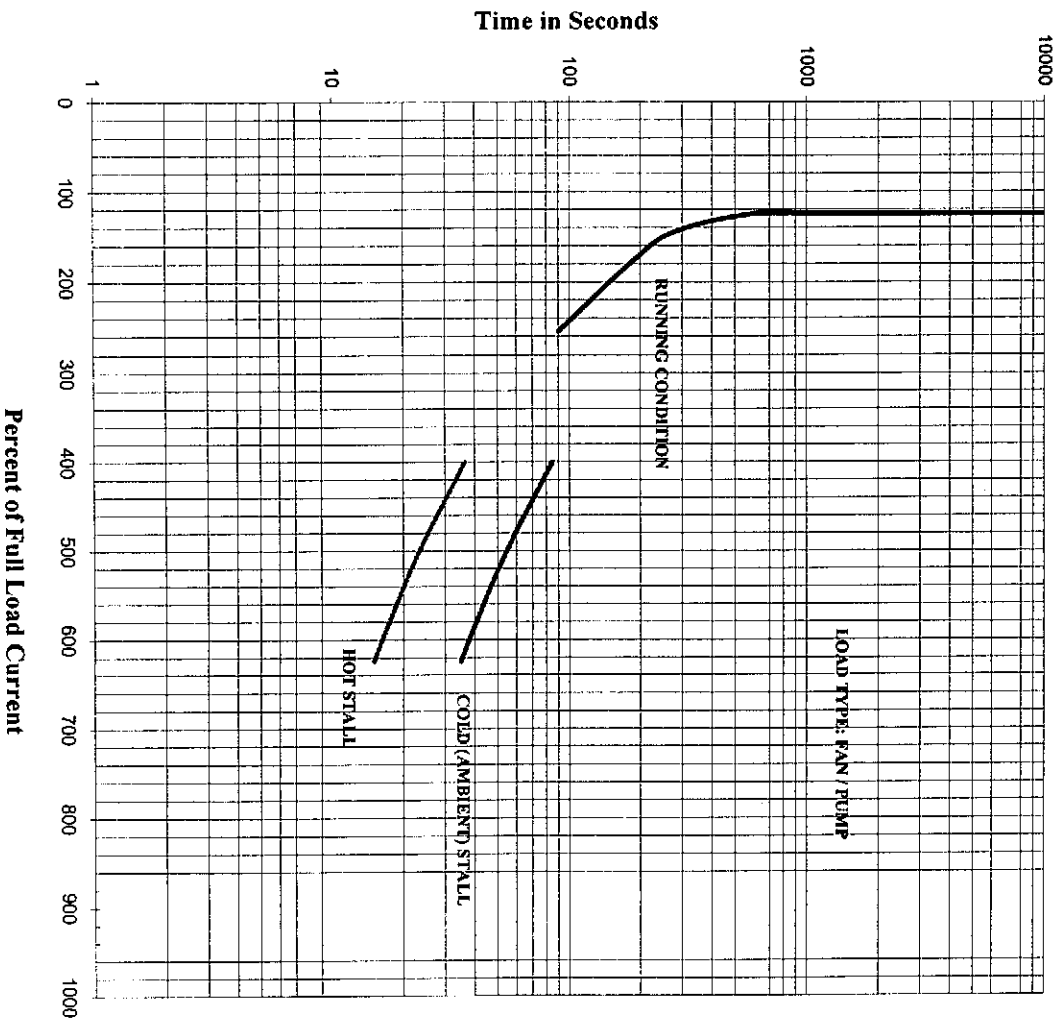
CERTIFIED BY: M.THORSON
DATE: 3/22/2007

TOSHIBA INTERNATIONAL CORPORATION

Thermal Limit & Acceleration Curves

Design Values (For Reference Only)

Model #:	4DL300L1DKEDHH			FLAmps:	41
Enclosure:	TEFC	Voltage:	4000 V	Frame:	N449T
Pole:	4	Frequency:	3 PH / 60 Hz	Ins. Class:	F
HP:	300	Rotor Inertia:	149.3 lb-ft ²	Date:	3/22/2007
FLRPM:	1785	Load Inertia:	N/A	File:	3Q4300U



Comments: PROJECT 138391

D.E. Curve #: 3Q4300U

TIC# 402377

PO# 3621

Prepared by: M.THORSON

Checked by: Kim Fischer

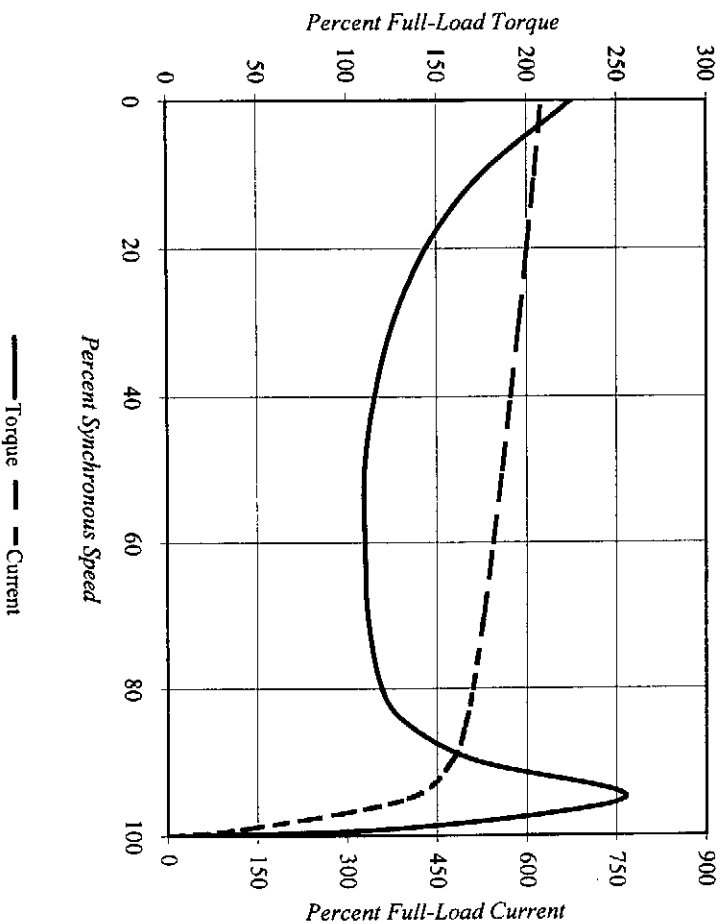
TOSHIBA INTERNATIONAL CORPORATION

Speed Torque/Current Curve

Model #:	4DL300L1DKEDHH			FLAmps:	41
Enclosure:	TEFC	Voltage:	4000 V	Frame:	N449T
Pole:	4	Frequency:	3 PH / 60 Hz	Ins. Class:	F
HP:	300	Rotor Inertia:	149.3 lb-ft²	Date:	3/22/2007
FLRPM:	1785	Load Inertia:	N/A	File:	3Q4300U

Locked Rotor Amps: 256 A **Load Type:** N/A
Locked Rotor Torque: 225% **Starting at:** N/A
Breakdown Torque: 255% **Accel. Time:** N/A
Rated Torque: 883 lb-ft

Design Values



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D.E. Curve #: 3Q4300U

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