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DWN.	J.H.LIANG	05.20.99		DWG N□.
CHKD.	C.S.LD	05 -26 -99	TEC®®Westinghouse	210490191451
APPD.	Y.B.HUANG	05 -26 -99		0104 / 01 / 14 01



**ISSUED** 

TYPE

8/29/2014

# **PERFORMANCE DATA**

ENCLOSURE TEE

TEFC

CATALOG#

NP0036

AEHH8P

**3-PHASE INDUCTION MOTOR** 

NAMEPL	ATE INFO	ORMATION
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Ol	JTPUT	POLE	FRAME	VOLTAGE HZ		RATED	INS.	NEMA	TIME	SERVICE
HP	KW	I OLL	SIZE	VOLTAGE	112	AMBIENT	CLASS	DESIGN	RATING	FACTOR
3	2.2	6	213T	230/460	60	40°C	F	В	CONT.	1.15

# **VARIABLE FREQUENCY DRIVE SERVICE**

	VARIABLE TORQUE							
HZ	TORQUE (lb-ft)							
3~60	0.0004~3	60~1200	0.035~13.41					

OHMS/PHASE EQUIVALENT WYE CIRCUIT (AT RATED OPERATING TEMPERATURE 25°C)

1.6662	2.8842	5.7461	7.5294	121.57
R1	R2	X1	X2	$X_{m}$

	CONSTAN	IT TORQUE		CONSTANT HORSEPOWER			
HZ	HP	RPM	TORQUE (lb-ft)	HZ	HP	RPM	TORQUE (lb-ft)
6~60	.3~3	120~1200	13.41	60~120	3	1200~2400	13.41~6.705

# **TYPICAL PERFORMANCE**

FULL		EFF	ICIENCY		P	OWER FACTO	SOUND	
LOAD	FULL	LOAD	3/4 LOAD %	1/2 LOAD %	FULL LOAD	3/4 LOAD %	1/2 LOAD %	PRESSURE LEVEL @ 3 FT
KFIVI	MIN.%	NOM.%	70	70	70	70	70	Db(A)
1175	87.5	89.5	89.5	87.5	78	70.5	85.5	54

	CURRENTS									SAFE	STALL
	NO LOAI	)	FULL LOAD			LOCKED ROTOR			NEMA KVA		E IN ONDS
AT 208	AT 230	AT 460	AT 208	AT 230	AT 460	AT 208	AT 230	AT 460	CODE LETTER	COLD	НОТ
VOLT	VOLT	VOLT									
3.73	4.18	2.09	8.89	8.04	4.02	57.9	64.0	32	K	88	62

	TORQUE			INERTIA			ACCEL	TIME (DOL)	STA	VABLE RTS HOUR
FULL LOAD (lb-ft)	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	ROTOR WR <sup>2</sup> (lb-ft <sup>2</sup> )	NEMA LOAD WK <sup>2</sup> (lb-ft <sup>2</sup> )	MAX ALLOWABLE WK <sup>2</sup> (lb-ft <sup>2</sup> )	NEMA LOAD WK <sup>2</sup> Sec	MAX ALLOWABLE WK <sup>2</sup> Sec	COLD	НОТ
13.41	210	180	340	0.918	44	378	4.98	42.00	2	1

APPROVED:	M. PRATER	DRAWING NO.	31057NP0036	REVISION:	1
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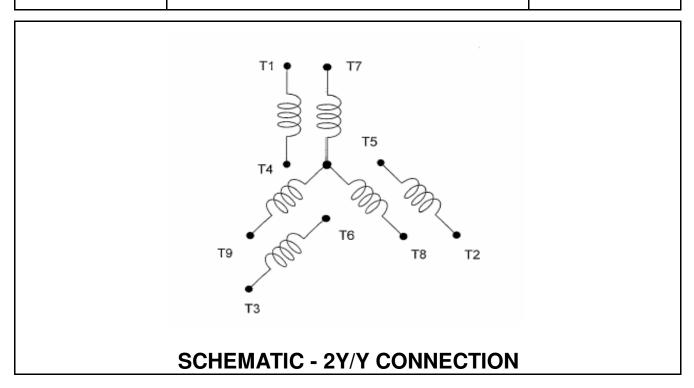
DATE:

December 6, 2010

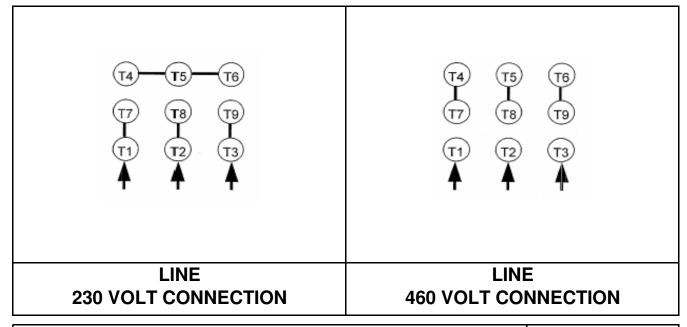
# **CONNECTION DIAGRAM**

CATALOG NO.:

**NP0036** 



# **ACROSS THE LINE CONNECTION**





DWG NO.

**DAC-1566-2** 



# INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR THREE PHASE INDUCTION MOTORS

Frames 143T - 449TZ



# **RECEIVING**

- 1. Check nameplate data.
- 2. Check whether any damage has occurred during transportation.
- 3. After removal of shaft clamp, turn shaft by hand to check that it turns freely.
- 4. If motor is to be reshipped (alone or installed to another piece of equipment) the shaft must again be clamped to prevent axial movement.

Note: Remove the bearing clamp before turning the shaft on 284T-449TZ frame motors.

# **WARNING**

# THE FOLLOWING SAFETY PRECAUTIONS MUST BE OBSERVED:

- 1. Electric rotating machinery and high voltage can cause serious or fatal injury if improperly installed, operated or maintained. Responsible personnel should be familiarized with NEMA MG-1; Safety Standards for Construction and Guide Selection. Installation and Use of Electric Motors and Generators; National Electric Code and all local safety requirements.
- 2. When servicing, all power sources to the motor and to the accessory devices should be de-energized and disconnected and all rotating parts should be at standstill.
- 3. Lifting means, when supplied, are intended for lifting the motor only. When two lifting devices are supplied with the motor a dual chain must be used.
- 4. Suitable protection must be used when working near machinery with high noise levels.
- 5. Safeguard or protective devices must not be by-passed or rendered inoperative.
- 6. The frame of this machine must be grounded in accordance with the National Electric Code and applicable local codes.
- 7. A suitable enclosure should be provided to prevent access to the motor by other than authorized personnel. Extra caution should be observed around motors that are automatically or have automatic re-setting relays as they may restart unexpectedly.
- 8. Shaft key must be fully captive or removed before motor is started.
- 9. Provide proper safeguards for personnel against possible failure of motor-mounted brake, particularly on applications involving overhauling loads.
- 10. Explosion proof motors are constructed to comply with the label service procedure manual, repair of these motors must be made by TECO-Westinghouse Motor Company or U/L listed service center in order to maintain U/L listing.

# **LOCATION**

- 1. Drip-proof motors are intended for use where atmosphere is relatively clean, dry, well ventilated and non-corrosive.
- 2. Totally enclosed motors may be installed where dirt, moisture, or dust are present and in outdoor locations.
- 3. Explosion-proof motors are built for use in hazardous locations as indicated by Underwriters' label on the motor.
- 4. Chemical duty enclosed motors are designed for installation in high corrosion or excessive moisture locations.

Note: in all cases, no surrounding structure should obstruct normal flow or ventilating air through or over the motor.

# MOUNTING

- 1. Mount motor securely on a firm, flat base. All ball bearing normal thrust motors up to and including 256T frame size may be side-wall or ceiling mounted; all others check nearest TECO-Westinghouse office for mounting recommendations.
- 2. Align motor accurately, using a flexible coupling if possible. For drive recommendations, consult with drive or equipment manufacturer, or TECO-Westinghouse.
- 3. Mounting bolts must be carefully tightened to prevent changes in alignment and possible damage to the equipment. The recommended tightening torque's for medium carbon steel bolts, identified by three radial lines at 120 degrees on the head, are:

Bolt Size	Recommended Torque (Ft-lb.)				
Boil Size	Minimum	Maximum			
2/8	25	37			
1/2	60	90			
5/8	120	180			
3/4	210	320			

- 4. V-belts Sheave Pitch Diameters should not be less than those shown in Table 1 (NEMA recommended values)
- 5. Tighten belts only enough to prevent slippage. Belt speed should not exceed 5000 ft. per min.

**TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)** 

						V-Belt Sheave			
						ntional D AND E		rrow AND 8V	
Frame Number	3600		power at s Speed, RPM 1200	И 900	Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches	
143T	1.5	1	.75	.5	2.2	4.25	2.2	2.25	
145T	2-3	1.5-2	1	.75	2.4	4.25	2.4	2.25	
182T	3	3	1.5	1	2.4	5.25	2.4	2.75	
182T	5				2.6	5.25	2.4	2.75	
184T			2	1.5	2.4	5.25	2.4	2.75	
184T	5				2.6	5.25	2.4	2.75	
184T	7.5	5		•••	3.0	5.25	3.0	2.75	
213T	7.5-10	7.5	3	2	3.0	6.5	3.0	3.375	
215T	10		5	3	3.0	6.5	3.0	3.375	
215T	15	10		•••	3.8	6.5	3.8	3.375	
254T	15		7.5	5	3.8	7.75	3.8	4	
254T	20	15		•••	4.4	7.75	4.4	4	
256T	20-25		10	7.5	4.4	7.75	4.4	4	
256T		20			4.6	7.75	4.4	4	
284T			15	10	4.6	9	4.4	4.625	
284T		25			5.0	9	4.4	4.625	
286T		30	20	15	5.4	9	5.2	4.625	

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

					V-Belt Sheave			
				Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V		
Frame		Synchronou	power at s Speed, RPN		Minimum Pitch Diameter	*Maximum Width Inches	Minimum Outside Diameter	**Maximum Width Inches
Number	3600	1800	1200	900	Inches		Inches	
324T		40	25	20	6.0	10.25	6.0	5.25
326T		50	30	25	6.8	10.25	6.8	5.25
364T			40	30	6.8	11.5	6.8	5
364T		60	•••	•••	7.4	11.5	7.4	5.785
365T			50	40	8.2	11.5	8.2	5.785
365T		75			9.0	11.5	8.6	5.785
404T			60		9.0	14.25	8.0	7.25
404T				50	9.0	14.25	8.4	7.25
404T		100			10.0	14.25	8.6	7.25
405T			75	60	10.0	14.25	10.0	7.25
405T		100			10.0	14.25	8.6	7.25
405T		125			11.5	14.25	10.5	7.25
444T			100		11.0	16.75	10.0	8.5
444T				75	10.5	16.75	9.5	8.5
444T		125			11.0	16.75	9.5	8.5
444T		150				16.75	10.5	8.5
445T			125		12.5	16.75	12.0	8.5
445T				100	12.5	16.75	12.0	8.5
445T		150				16.75	10.5	8.5

<sup>\*</sup>Max. Sheave width = 2(N-W) - .25

# **POWER SUPPLY & CONNECTIONS**

- 1. Wiring of motor and control, overload protection and grounding should be in accordance with National Electrical Code and all local safety requirements.
- 2. Nameplate voltage and frequency should agree with power supply. Motor will operate satisfactorily on line voltage within ±10% of nameplate voltage; or frequency with ±5% and with a combined variation not to exceed ±10%. 230-volt motors can be used on 208-volt network systems, but with slightly modified performance characteristics as shown on the nameplate.
- 3. Dual voltage and single voltage motors can be connected for the desired voltage by following connection diagram shown on the nameplate or inside of the conduit box.
- 4. All Explosion Proof motors have Temperature Limiting Devices in the motor enclosure to prevent excessive external surface temperature of the motor in accordance with U/L standards. Terminals of thermal protectors (P1 & P2) should be connected to the motor control equipment, according to the connection diagram inside of the conduit box.
- 5. Standard connection diagram for three phase, not thermally protected, dual rotation motors are shown in diagrams A through E. (Note: To change rotation, Interchange any two line leads)

<sup>\*\*</sup>Max Sheave width = N-W

<sup>\*\*\*</sup>Sheave ratios grater than 5:1 and center-to-center distance less than the diameter of the large sheave should be referred to TECO-Westinghouse.

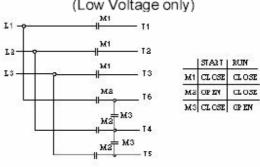
# A. 3 Lead, Single Voltage

# B. 6 Lead, Dual Voltage & Voltage Ration 1 to 3

B-1 Across the Line Start & Run

	Low Vol	hage	High Voltage		
L1 —	T1	T6	I1 71		
L2—	12	T4	I.2 T2 o T4		
L3 —	13	15	r <sub>2</sub> 13		

B-2 Wye Start & Delta Run (Low Voltage only)

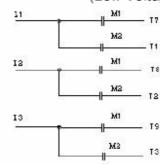


# C. 9 Leads; Dual Voltage & Voltage Ratio 1 to 2, Wye Connected

C-1 Across the Line Start & Run

Low Voltage	High Veltage
11 12 13 	L1 L2 L3
11 0 12 0 13 0	T1 & T2 & T3 &
17 • 18 • 19 •	7 78 T9
T4 T5 T6	T4 15 0 16 0

C-2 Part Winding Start (Low Voltage only)



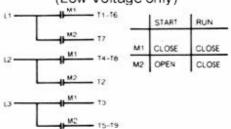
	START	RUN
мі	CLOSE	CLOSE
M2	OPEN	CLOSE
Tie Toge	(T4-T5-T6) ther	

# D. 9 Leads; Dual Voltage & Voltage Ration 1 to 2, Delta Connected

D-1 Across the Line Start & Run

LOW VOLTAGE (2Δ)	HIGH VOLTAGE (△)	
L1 L3 L2	(1 13 L2	
T1 0 T3 0 T2 0	T1	
770 750 780	170 150 TB	
T60 T90 T40	160 0 140	

D-2 Part Winding Start (Low Voltage only)

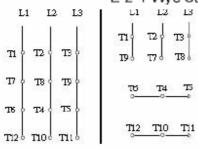


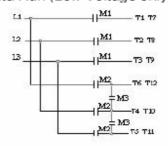
# E. 12 Leads, Dual Voltage

E-1 Across the Line Start & Run

Low	Voltage	High Voltage		
L1	12 L3	L1 L2 L		
TI TI	T3 0	מ עד אוז		
T7 T8	T9 0	Ti2 Ti0 Til		
тб т4	12 p	T6 ° T4 ° T5		
T12 0 T10	Tilo	19 T7 T8		

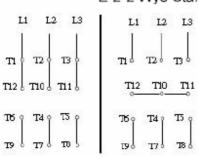
E-2-1 Wye Start & Delta Run (Low Voltage only)

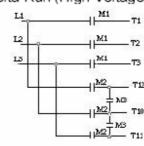




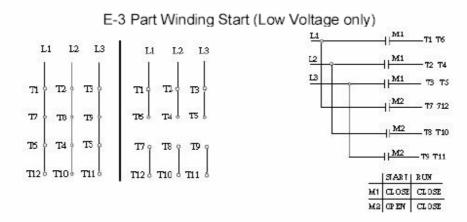
	START	RUN
М1	CLOSE	CLOSE
М2	OPEN	CLOSE
мз	CLOSE	OPEN

E-2-2 Wye Start & Delta Run (High Voltage only)





120	STAR1	RUN
MI	CLOSE	CLOSE
M2	DP EN	CLOSE
мз	CLOSE	OPEN



\*Important: For Part Winding Start, M2 contactor should be closed within two (2) seconds after M1 contactor is closed.

Only 4 pole and above (e.g., 6P, 8P...) motors are satisfactory for Part Winding Start at low voltage.

# **START UP**

- Disconnect load and start motor. Check direction of rotation. If rotation must be changed, ALLOW THE MOTOR TO STOP COMPLETLEY. Interchange any two leads of a three-phase motor.
- 2. Connect load. The motor should start quickly and run smoothly. If no, shut power off at once. Recheck the assembly including all connections before restarting.
- 3. If excessive vibration is noted, check for loose mounting bolts too flexible motor support structure or transmitted vibration from adjacent machinery. Periodic vibration checks should be made; foundations often settle.
- 4. Operate under load for short period of time and check operating current against nameplate.

# **TESTING**

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a megometer. Depending on the length and conditions of storage it may be necessary to regrease or change rusted bearings.

If the resistance is lower than one megohm the windings should be dried in one of the following two ways:

- 1. Bake in oven at temperatures not exceeding 194°F until insulation resistance becomes constant.
- 2. With rotor locked, apply low voltage and gradually increase the current through windings until temperature measured with a thermometer reaches 194°F. Do not exceed this temperature.

# **MAINTENANCE**

#### **INSPECTION**

Inspect motor at regular intervals. Keep motor clean and ventilation openings clear.

#### LUBRICATION

- 1. Frame 143T-256T: Double shielded and pre-lubricated ball-bearing motors without grease fittings and don't need re-lubrication, except on MAX-E1<sup>®</sup> and MAX-E2<sup>®</sup> products which have re-greasable features.
- 2. Frames 280TS, 320-449TZ(TS): Motors having grease fittings and grease discharge devices at brackets. Motors are shipped with grease for initial running. It is necessary to re-lubricate anti-friction bearing motors periodically, depending on size and type of service. See Table 2 to provide maximum bearing life. Excessive or too frequent lubrication may damage the motor.

### **TABLE 2**

Horsepower	Standard Conditions	Severe Conditions	Extreme Conditions
1 Thru 30 Hp, 1800 rpm and below 40 Thru 75 Hp, 1800 rpm and below	7 years 210 days	3 years 70 days	180 days 30 days
100 Thru 150 Hp, 1800 rpm and below	90 days	30 days	15 days
1 Thru 20 Hp, 3600 rpm	5 years	2 years	90 days
25 Thru 75 Hp, 3600 rpm	180 days	60 days	30 days
100 Thru 150 Hp, 3600 rpm	90 days	30 days	15 days

### Note:

- A. Standard conditions: 8 hours operation per day, normal or light loading, clear and 40°C ambient conditions.
- B. Severe conditions: 24-hour operation per day or light shock loading, vibration or in dirty or dusty conditions.
- C. Extreme conditions: With heavy shock loading or vibration or dusty conditions.
- D. For double shielded bearings, above data (lubrication frequency) means that the bearing must be replaced.
- 3. Be sure fittings are clean and free from dirt. Using a low-pressure grease gun, pump in the recommended grease until new grease appears at grease discharge hole.
- 4. Use the POLYUREA grease unless special grease is specified on the nameplate.
- 5. If re-lubrication is to be performed with the motor running, stay clear of rotating parts. After re-greasing, allow the motor to run for ten to thirty minutes.

# **RENEWAL PARTS**

- 1. Use only genuine TECO-Westinghouse renewal parts or as recommended by TECO-Westinghouse Motor Company.
- 2. When you order renewal parts please specify complete information to TECO-Westinghouse office/agent such as type, frame no., poles, horsepower, voltage, series no., quantity, etc.

# FOR FURTHER INFORMATION PLEASE CONTACT TECO-WESTINGHOUSE MOTOR COMPANY

Round Rock, TX 800-873-8326