

# MAX-VH™



## *Vertical Hollow Shaft Motors*



**TECO**   **Westinghouse**



# Specifications

	ITEM	STANDARD SPECIFICATION	
RATING	Type Of Motors	Squirrel Cage Induction Motors (SCIM)	
	Design Standards	NEMA MG-1, MG-13	
	Voltages	230V/ 460V (Usable on 208V), 460V. 150 hp and Larger are 460V Only	
	Frequency	60 Hz	
	Output Range	7.5 hp - 400 hp	
	RPM (SYN.)	1800 RPM	
	Time Duty	1.15 Service Factor - Continuous on Sine Wave Power, 1.0 Service Factor on PWM	
	Frame Size	213TP - 449TP	
	Protection Enclosure	NEMA Weather Protected Type 1 (WP1)	
	Cooling Method	Self Ventilated, Interior Cooling (IC 01)	
Mounting	Flange Mounting (IM3011)		
APPLICATION	Power Conditions	Voltage: $\pm 10\%$ , Frequency: $\pm 5\%$ , and $\pm 10\%$ Max. of Combined Voltage and Frequency, but Frequency Variation Does Not Exceed $\pm 5\%$	
	Designed Primarily	For Deep Well Turbine Pump Applications	
	Environment Conditions	Place: Non-Hazardous, Ambient Temperature: $-15^{\circ}\text{C}$ - $40^{\circ}\text{C}$ , Relative Humidity: Less Than 80% RH (Non-Condensation), Altitude: Less Than 3,300 ft	
	Operating Conditions	For Direct Coupling	
	Direction Of Rotation	Counterclockwise (View From Top Side)	
Method Of Starting	Direct On-Line or Part Wind Start or VFD		
CONSTRUCTION	Frame	High Grade Cast Iron	
	Flange Bracket (Shield)	High Grade Cast Iron, Dimensions as NEMA Mg1-18-238 (P-Base)	
	Upper Bracket	High Grade Cast Iron (Frame Size 324TP - 449TP Design Including Oil Tank)	
	External Fan	Cast Iron	
	Vertical Splash Cover	Steel Plate	
	Shaft	1045 Carbon Hollow Steel Shaft	
	Thrust Bearing (Upper)	213TP - 286TP - Re-Greasable Angular Contact with Polyrex EM Grease 324TP - 449TP - Oil Lubricated Angular Contact with Site Glass	
	Guide Bearing (Lower)	213TP - 286TP - Grease Pre-Packed, Double Shielded Rolling Bearings 324TP - 449TP - Bracket Mounting, Vacuum De-Gassed, High Quality Open Bearings with Grease Relief Valve	
	Lubricant	Thrust Bearing: Frame Size 324TP-449TP Recommended Oil Turbine Oil with Viscosity 300 S.S.U. at $100^{\circ}\text{F}$ The Other Frame Size as Guide Bearing: Mineral Oil Li-Base Grease (Multemp SRL)	
	Terminal Housing	Cast Iron, Larger Size, Can Be Set $90^{\circ}$ Apart, Threaded For External Conduit Entrance	
	Lead Terminal	210TP - 365TP - 9 Leads (PWS on 230V) 404TP - 405TP - 12 Leads (PWS on 230V) 444TP and Larger - 6 Leads (PWS on 460V)	
	Iron Core	High Grade, Insulated, Cold-Rolled Electro-Magnetic Steel Plate	
	Stator Winding	Pre-Formed Random Wound, Made Of Heavy, Heat-Resistant and Polyester Enameled Copper Wire	
	Stator Insulation	Class F Insulation System with Class B Temperature Rise	
	Varnish Treatment	Phenolic Alkyd Resin Varnish and 1-Spray Finishing Varnish, 2 Dips and Bakes	
	Rotor Winding	Squirrel Cage, Aluminum Conductor With End-Ring and Wafer Blades Integrally Cast	
	Painting	Phenolic Rust Proof Base Plus Lacquer Surface, Finished Painting in Blue - Gray Color (Munsell 7.5B 3.5/ 0.5)	
	Name Plate	Stainless Steel Plate	
	Bolt Thread	ISO Metric System Unless Thread in Coupling	
	Additional Parts	Standard with Gib Key, Non-Reverse Ratchet and Heavy Duty Stainless Steel Pins	
	Grounding Terminal	Located Inside of Terminal Housing and on P-Base	
	PERFORMANCE	Test Procedure	IEEE-112, Methods B & F, and Full Voltage Measuring Starting Performance
		Temperature Rise	Not to Exceed $90^{\circ}\text{C}$ for S.F. 1.15 or $80^{\circ}\text{C}$ for S.F. 1.0 by Resistance Method
Over Speed		125% SYN. R.P.M. for Two Min	
Over Torque		160% Rated Torque for 15 Seconds	
Inverter Duty		4:1 Variable Torque	
OTHER	Optional	Steady Bushing and Alternate Upper Couplings	
	Warranty	36 Month Warranty From Date of Manufacture	

# Performance Data

## TYPICAL PERFORMANCE (460V)

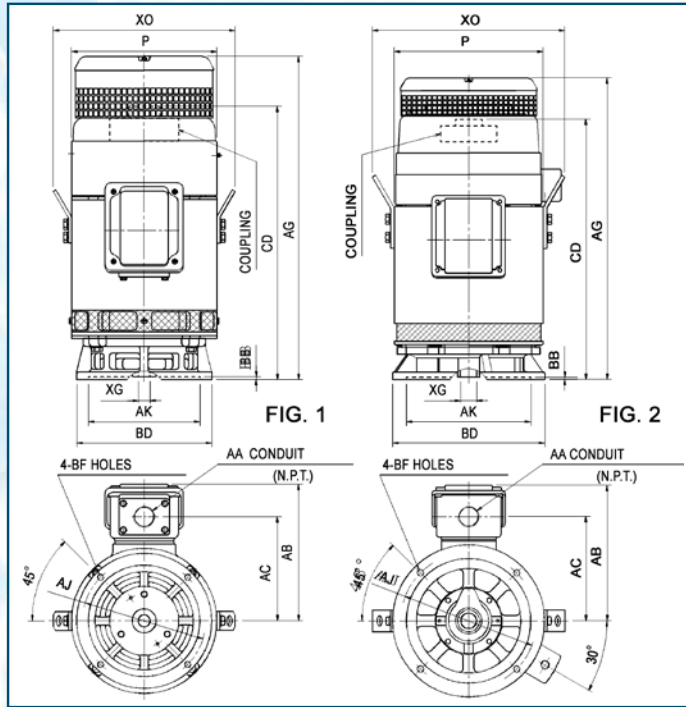
CATALOG NO.	HP	FULL LOAD RPM	FRAME SIZE	EFFICIENCY(%)				POWER FACTOR(%)			CURRENT		TORQUE				DOWN THRUST LBS	NEMA CODE LETTER
				FULL LOAD		3/4 LOAD NOM.	1/2 LOAD NOM.	FULL LOAD	3/4 LOAD	1/2 LOAD	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD LB-FT	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT		
				NOM.	MIN.													
VH7/54	7.5	1745	213TP	88.5	86.5	89.0	89.0	85.0	80.0	69.0	9.35	63.5	22.57	205	175	255	2600	H
VH0104	10	1740	215TP	89.5	87.5	90.5	90.5	86.5	82.0	72.5	12.10	81.0	30.18	215	190	260	2600	H
VH0154	15	1760	254TP	91.0	89.5	91.5	91.5	88.0	85.5	78.0	17.55	116.0	44.75	210	160	245	3350	G
VH0204	20	1755	256TP	91.0	89.5	92.0	92.0	88.0	86.0	79.0	23.40	145.0	59.83	210	160	230	3350	G
VH0254	25	1755	284TP	91.7	90.2	92.0	91.5	86.0	83.5	77.0	29.70	182.5	74.79	205	165	230	3350	G
VH0304	30	1760	286TP	92.4	91.0	92.5	92.0	86.5	84.0	77.0	35.15	217.5	89.50	220	175	230	3350	G
VH0404	40	1765	324TP	93.0	91.7	93.6	94.1	88.0	86.5	81.5	45.75	290.0	119.00	210	160	225	5700	G
VH0504	50	1770	326TP	93.0	91.7	93.5	93.5	88.0	86.0	80.0	57.00	362.5	148.30	225	165	245	5700	G
VH0604	60	1770	364TP	93.6	92.4	93.6	93.1	84.5	81.5	73.5	71.00	435.0	178.00	200	165	230	6000	G
VH0754	75	1775	365TP	94.1	93.0	94.6	94.6	84.5	83.5	76.0	88.50	542.5	221.80	200	170	240	6000	G
VH1004	100	1775	404TP	94.1	93.0	94.1	94.1	86.0	82.0	73.5	115.50	725.0	295.80	200	180	270	7900	G
VH1254	125	1775	405TP	94.5	93.6	94.1	94.1	87.5	85.0	78.0	141.50	907.5	369.70	180	150	210	7900	G
VH1504	150	1776	444TP	95.0	94.1	94.5	93.6	86.0	83.0	78.5	172.00	1085.0	442.00	135	114	210	10700	G
VH2004	200	1778	445TP	95.0	94.1	94.5	93.6	86.5	83.0	80.0	228.00	1450.0	587.00	125	105	205	10700	G
VH2504	250	1780	445TP20	95.4	94.5	95.0	94.1	86.5	83.0	80.0	284.00	1825.0	735.00	125	105	205	13400	G
VH3004	300	1783	447TP	95.4	94.5	95.0	94.1	87.5	84.0	81.0	337.00	2200.0	883.00	125	105	205	13400	G
VH3504	350	1785	447TP	95.4	94.5	95.0	94.1	88.0	84.5	81.5	390.00	2590.0	1034.00	125	105	205	13300	G
VH4004	400	1787	449TP	95.4	94.5	95.0	94.1	88.5	85.0	82.0	444.00	2960.0	1179.00	125	105	205	13200	G

### Notes:

1. The above are typical values based on tests according to ANSI/ IEEE Standard 112, Method B.
2. Breakdown and locked rotor torques are shown as average expected values.
3. Efficiency, power factor, speed and torque are the same for other voltages; current values vary inversely with voltage.
4. Efficiency values shown do not include thrust bearing losses.
5. Tolerance according to NEMA MG1-12 and IEC 34-1.
6. Down thrust based on an L10 bearing life of 8,800 hours.
7. Alternate coupling kits available to give additional BX combinations.
8. Steady bushing kits available.



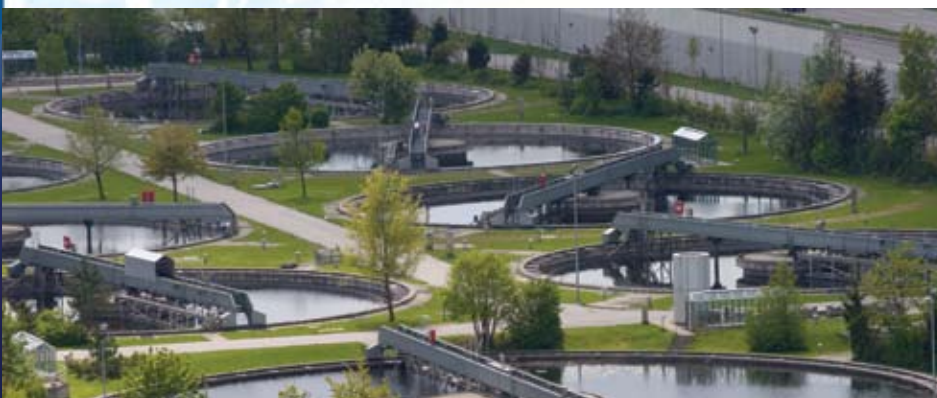
# Dimensions: Frame Sizes 213TP ~ 405TP



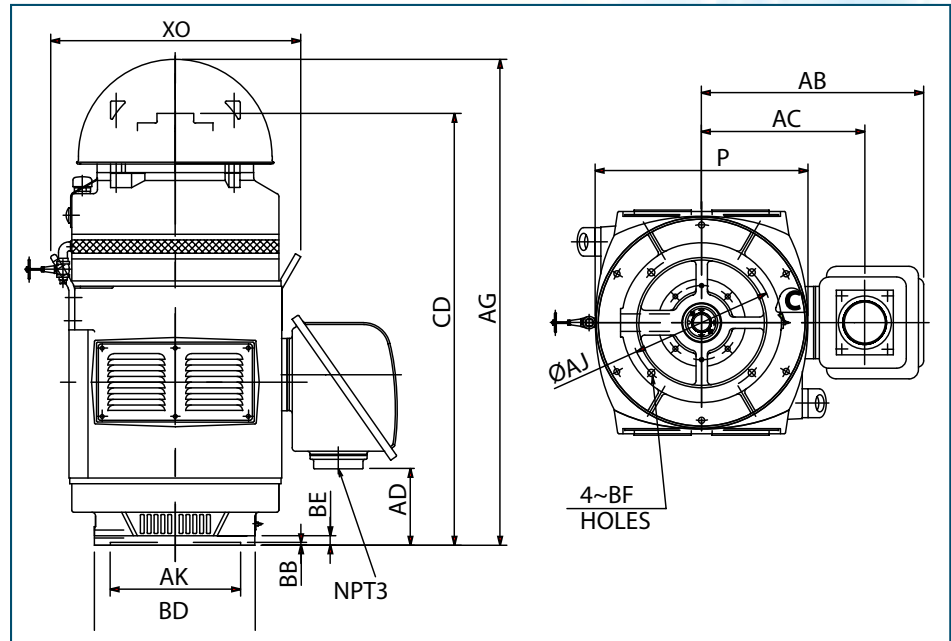
FRAME SIZE	FIG NO.	AG	CD	P	XG	XO	MOUNTING					TERMINAL HOUSING			BEARINGS		APPROX. WEIGHT (LBS)
							AJ	AK	BB	BD	BF	AA	AB	AC	LOWER END	UPPER END	
213TP 215TP	1	23.93	20.25	10.74	1.122	13.47	9.125	8.25	0.22	10.00	0.44	1"	10.12	7.68	6209ZZC3	7310B	197 209
254TP 256TP	1	26.91	23.38	12.95	1.378	17.68	9.125	8.25	0.25	10.00	0.44	1 1/4"	11.30	8.86	6309ZZC3	7311B	303 324
284TP 286TP	1	28.25	24.75	14.53	1.378	19.25	9.125	8.25	0.25	10.00	0.44	1 1/2"	14.58	11.18	6312ZZC3	7312B	417 456
324TP 326TP	2	32.71	28.22	16.14	1.653	20.87	14.750	13.50	0.28	16.50	0.69	3"	14.72	11.30	6312C3	* 7220B	622 675
364TP 365TP	2	35.89	31.16	17.52	1.653	22.40	14.750	13.50	0.28	16.50	0.69	3"	16.81	12.80	6313C3	* 7220B	775 860
404TP 405TP	2	42.32	36.94	19.69	2.000	24.88	14.750	13.50	0.28	16.50	0.69	3"	19.41	14.76	6315C3	* 7322B	1111 1215

## Notes:

- Dimension AK tolerance:  
For 8.250 inches: +0.003 inches, -0.000 inches  
For 13.500 inches: +0.005 inches, -0.000 inches
- With non-reverse ratchet mechanism
- Rotating direction: counterclockwise (viewed from coupling end)
- \*Marked bearings are oil lubricated, all others are grease lubricated.



# Dimensions: Frame Sizes 444TP ~ 449TP



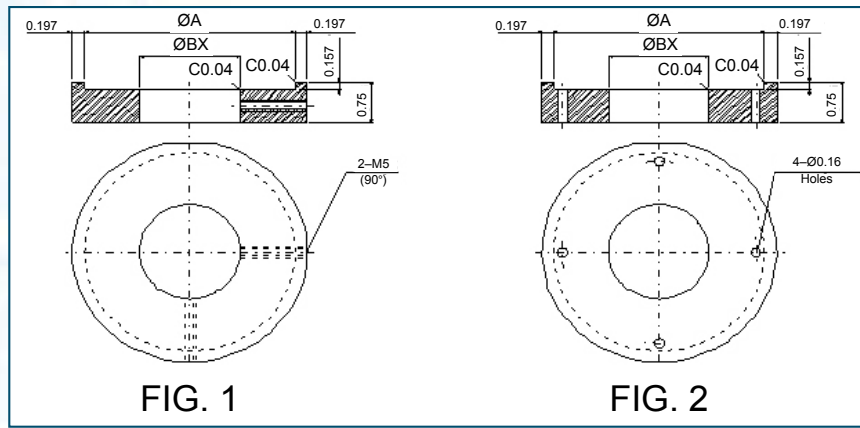
FRAME SIZE (SSV)	MOUNTING						CD	XG	AG	XO	P	TERMINAL HOUSING			BEARINGS		APPROX. WEIGHT (LBS)
	AK	AJ	BD	BF	BB	BE						AB	AC	AD	UPPER END	LOWER END	
444TP	13.50	14.75	16.50	0.69	0.25	1.00	44.78	2.000	50.40	26.00	22.05	23.05	16.95	7.95	7324B	6316C3	1530
445TP	13.50	14.75	16.50	0.69	0.25	1.00	44.78	2.000	50.40	26.00	22.05	23.05	16.95	7.95	7324B	6316C3	1820
445TP20	13.50	14.75	20.00	0.69	0.25	1.00	44.78	2.000	50.40	26.00	22.05	23.05	16.95	7.95	7324B	6316C3	1940
447TP	13.50	14.75	20.00	0.69	0.25	1.00	44.78	2.362	50.50	27.55	24.00	24.00	17.90	6.65	7326B	6318C3	2470 & 2900
449TP	13.50	14.75	20.00	0.69	0.25	1.00	53.91	2.362	59.73	27.55	24.00	24.00	17.90	11.05	7326B	6318C3	3320

## Notes:

1. Dimension AK tolerance:  
For 8.250 inches: +0.003 inches, -0.000 inches  
For 13.500 inches: +0.005 inches, -0.000 inches
2. With non-reverse ratchet mechanism
3. Rotating direction: counterclockwise (viewed from coupling end)
4. Thrust bearings are oil lubricated.
5. 447TP frame size - 300 hp motor is 2470 lbs and 350 hp motor is 2900 lbs



# Dimensions - Steady Bushing



FRAME		A	BX	CATALOG NO.
210TP	FIG. 1	1.77	0.751	SB210-0.751
			0.876	SB210-0.876
			0.938	SB210-0.938
			1.001	SB210-1.001
250TP	FIG. 1	1.77	0.751	SB250-0.751
			0.876	SB250-0.876
			1.001	SB250-1.001
			1.188	SB250-1.188
			1.251	SB250-1.251
280TP	FIG. 1	2.17	0.751	SB280-0.751
			0.876	SB280-0.876
			1.001	SB280-1.001
			1.188	SB280-1.188
			1.251	SB280-1.251
320TP	FIG. 2	2.83	1.001	SB320-1.001
			1.188	SB320-1.188
			1.251	SB320-1.251
			1.438	SB320-1.438
			1.501	SB320-1.501
360TP	FIG. 2	3.03	1.001	SB360-1.001
			1.188	SB360-1.188
			1.251	SB360-1.251
			1.438	SB360-1.251
400TP	FIG. 2	3.54	1.501	SB360-1.501
			1.188	SB400-1.188
			1.251	SB400-1.251
			1.438	SB400-1.438
			1.501	SB400-1.501
			1.688	SB400-1.688
			1.751	SB400-1.751

FRAME		A	BX	CATALOG NO.
444 - 445TP	FIG. 2	4.09	1.188	SB444/5-1.188
			1.251	SB444/5-1.251
			1.438	SB444/5-1.438
			1.501	SB444/5-1.501
			1.688	SB444/5-1.688
447-449TP	FIG. 2	4.09	1.751	SB444/5-1.751
			1.938	SB444/5-1.938
			1.438	SB447/9-1.438
			1.501	SB447/9-1.501
			1.688	SB447/9-1.688
			1.751	SB447/9-1.751
			1.938	SB447/9-1.938
			2.001	SB447/9-2.001
			2.063	SB447/9-2.063
			2.126	SB447/9-2.126
			2.188	SB447/9-2.188
			2.251	SB447/9-2.251
			2.376	SB447/9-2.376
			2.438	SB447/9-2.438
			2.501	SB447/9-2.501

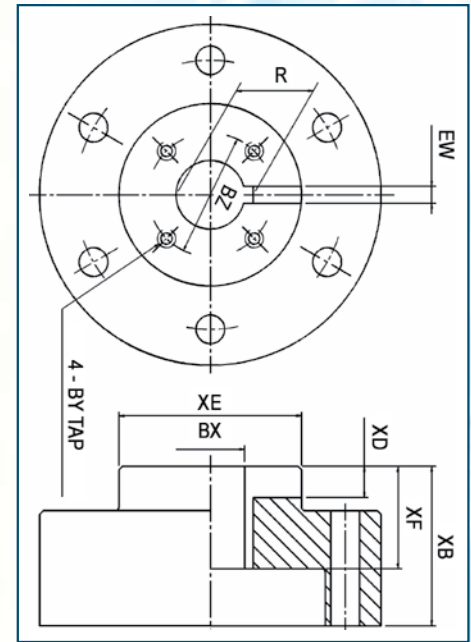


## Notes:

Tolerance on BX dimensions up to and including 1.500 inches diameter: 0 ~ +0.001 inches;  
larger than 1.500 inches diameter: 0 ~ +0.0015 inches.

# Dimensions - Coupling

FRAME	BX	BY	BZ	EW	R	XB	XD	XE	XF	CATALOG NO.
213TP 215TP	0.751	NO. 10-32 UNF	1.375	0.188	0.845	1.75	0.406	2.000	1.125	AC210-0.751
	0.876	NO. 10-32 UNF	1.375	0.188	0.970	1.75	0.406	2.000	1.125	AC210-0.876
	0.938	NO. 10-32 UNF	1.375	0.250	1.078	1.75	0.406	2.000	1.125	AC210-0.938
	*1.001	NO. 10-32 UNF	1.375	0.250	1.126	1.75	0.406	2.000	1.125	AC210-1.001
254TP 256TP	0.751	NO. 10-32 UNF	1.375	0.188	0.845	2.17	0.410	2.250	1.230	AC250-0.751
	0.876	NO. 10-32 UNF	1.375	0.188	0.970	2.17	0.410	2.250	1.230	AC250-0.876
	1.001	NO. 10-32 UNF	1.375	0.250	1.126	2.17	0.410	2.250	1.230	AC250-1.001
	*1.188	1/4"-20 UNC	1.750	0.250	1.313	2.17	0.410	2.250	1.230	AC250-1.188
	1.251	1/4"-20 UNC	1.750	0.250	1.376	2.17	0.410	2.250	1.230	AC250-1.251
284TP 286TP	0.751	NO. 10-32 UNF	1.375	0.188	0.845	2.17	0.410	2.250	1.230	AC280-0.751
	0.876	NO. 10-32 UNF	1.375	0.188	0.970	2.17	0.410	2.250	1.230	AC280-0.876
	1.001	NO. 10-32 UNF	1.375	0.250	1.126	2.17	0.410	2.250	1.230	AC280-1.001
	*1.188	1/4"-20 UNC	1.750	0.250	1.313	2.17	0.410	2.250	1.230	AC280-1.188
	1.251	1/4"-20 UNC	1.750	0.250	1.376	2.17	0.410	2.250	1.230	AC280-1.251
324TP 326TP	1.001	NO. 10-32 UNF	1.375	0.250	1.126	2.54	0.410	2.875	1.540	AC320-1.001
	*1.188	1/4"-20 UNC	1.750	0.250	1.313	2.54	0.410	2.875	1.540	AC320-1.188
	1.251	1/4"-20 UNC	1.750	0.250	1.376	2.54	0.410	2.875	1.540	AC320-1.251
	1.438	1/4"-20 UNC	2.125	0.375	1.625	2.54	0.470	2.875	1.540	AC320-1.438
	1.501	1/4"-20 UNC	2.125	0.375	1.688	2.54	0.470	2.875	1.540	AC320-1.501
364TP 365TP	1.001	NO. 10-32 UNF	1.375	0.250	1.126	2.54	0.410	2.875	1.540	AC360-1.001
	1.188	1/4"-20 UNC	1.750	0.250	1.313	2.54	0.410	2.875	1.540	AC360-1.188
	*1.251	1/4"-20 UNC	1.750	0.250	1.376	2.54	0.410	2.875	1.540	AC360-1.251
	1.438	1/4"-20 UNC	2.125	0.375	1.625	2.54	0.530	2.875	1.540	AC360-1.251
	1.501	1/4"-20 UNC	2.125	0.375	1.688	2.54	0.530	2.875	1.540	AC360-1.501
404TP 405TP	1.188	1/4"-20 UNC	1.750	0.250	1.313	2.76	0.530	3.150	1.500	AC400-1.188
	1.251	1/4"-20 UNC	1.750	0.250	1.376	2.76	0.530	3.150	1.500	AC400-1.251
	1.438	1/4"-20 UNC	2.125	0.375	1.625	2.76	0.530	3.150	1.500	AC400-1.438
	*1.501	1/4"-20 UNC	2.125	0.375	1.688	2.76	0.530	3.150	1.500	AC400-1.501
	1.688	1/4"-20 UNC	2.500	0.375	1.891	2.76	0.530	3.150	1.500	AC400-1.688
	1.751	1/4"-20 UNC	2.500	0.375	1.954	2.76	0.530	3.150	1.500	AC400-1.751
444TP 445TP	1.188	1/4"-20 UNC	1.750	0.250	1.304	4.35	0.406	3.740	2.875	AC444/5-1.188
	1.251	1/4"-20 UNC	1.750	0.250	1.367	4.35	0.406	3.740	2.875	AC444/5-1.251
	1.438	1/4"-20 UNC	2.125	0.375	1.605	4.35	0.531	3.740	2.875	AC444/5-1.438
	1.501	1/4"-20 UNC	2.125	0.375	1.669	4.35	0.531	3.740	2.875	AC444/5-1.501
	*1.688	1/4"-20 UNC	2.500	0.375	1.859	4.35	0.531	3.740	2.875	AC444/5-1.688
	1.751	1/4"-20 UNC	2.500	0.375	1.922	4.35	0.531	3.740	2.875	AC444/5-1.751
	1.938	1/4"-20 UNC	2.500	0.500	2.160	4.35	0.688	3.740	2.875	AC444/5-1.938
445TP20 447TP 449TP	1.438	1/4"-20 UNC	2.125	0.375	1.605	4.74	0.531	4.725	3.071	AC447/9-1.438
	1.501	1/4"-20 UNC	2.125	0.375	1.669	4.74	0.531	4.725	3.071	AC447/9-1.501
	*1.688	1/4"-20 UNC	2.500	0.375	1.859	4.74	0.531	4.725	3.071	AC447/9-1.688
	1.751	1/4"-20 UNC	2.500	0.375	1.922	4.74	0.531	4.725	3.071	AC447/9-1.751
	1.938	1/4"-20 UNC	2.500	0.500	2.160	4.74	0.688	4.725	3.071	AC447/9-1.938
	2.001	3/8"-16 UNC	3.250	0.500	2.223	4.74	0.688	4.725	3.071	AC447/9-2.001
	2.063	3/8"-16 UNC	3.250	0.500	2.287	4.74	0.688	4.725	3.071	AC447/9-2.063
	*2.126	3/8"-16 UNC	3.250	0.500	2.350	4.74	0.688	4.725	3.071	AC447/9-2.126
	2.188	3/8"-16 UNC	3.250	0.500	2.414	4.74	0.688	4.725	3.071	AC447/9-2.188
	2.251	3/8"-16 UNC	3.250	0.500	2.477	4.74	0.688	4.725	3.071	AC447/9-2.251
	2.376	3/8"-16 UNC	3.250	0.625	2.651	4.74	0.813	4.725	3.071	AC447/9-2.376
2.438	3/8"-16 UNC	3.250	0.625	2.714	4.74	0.813	4.725	3.071	AC447/9-2.438	
2.501	3/8"-16 UNC	3.250	0.625	2.778	4.74	0.813	4.725	3.071	AC447/9-2.501	



## Notes:

1. Tolerance on BX dimensions up to and including 1.500 inches diameter: +0.001 inches, -0.000 inches; larger than 1.500 inches diameter: +0.0015 inches, -0.0000 inches.
2. Dimension EW tolerance: +0.002 inches, -0.000 inches.
3. Dimension R tolerance: +0.010 inches, -0.000 inches.
4. \* Marked table applied to standard size for each frame.

# AC Drives and Controls

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## TECO-WESTINGHOUSE MOTOR COMPANY – YOUR TOTAL SOLUTIONS PROVIDER

From wastewater, petrochemical, irrigation and water treatment, to pumping and lift stations, TECO-Westinghouse Motor Company has the AC drive products that will enhance your application.

TWMC AC drives are used in virtually every process phase from water supply to effluent; in waste water, water treatment as well as industrial applications. Our drives are used in chemical, pulp and paper, steel and other applications where using the proper drive/ motor system is a critical component to the smooth operation of any facility. TECO-Westinghouse Motor Company AC drives can be relied on to control flow and reduce energy costs, while also reducing maintenance costs.

### SUPPORT

TECO-Westinghouse's AC drive support network provides excellence in sales, technical support and services to our customers. Our trained and authorized start-up and service partners are strategically located throughout the United States to help support your application.

### SERVICES OFFERED

- Extensive stock of drives strategically located throughout the United States
- 24-hour technical support
- On-site or in-factory drives training
- Sales training
- Start-up training
- Service training
- Customized training to meet your requirements
- On-site technical assistance
- Warranty service and support

### ENERGY SAVINGS

TECO-Westinghouse Motor Company provides energy saving software at no cost to help our customers determine their actual return on investment. Power savings of as much as 50% can be reached by reducing motor speed as little as 25%. With rising energy costs, this software can be a valuable tool in determining project paybacks.





# MA7200 Plus - Pump Duty AC Drive

## FEATURES

The MA7200 Plus pump talk software provides quick set-up for the drive for a wide range of pump-related applications.

### ■ Horsepower

- 230 VAC, 1–50 hp\*
- 460 VAC, 1–100 hp\*

\* Variable Torque Operation

### ■ Dual Ratings

- Normal Duty Rated (110% OL/ 1 Minute)
- Heavy Duty Rated (150% OL/ 1 Minute)

### ■ Two Control Methods

- Open Loop (Sensorless) Vector
- Volts/ Hertz

### ■ Motor Auto Tuning for Optimum Performance in Sensorless Vector Mode

- Full Dynamic Tuning (spinning motor)

### ■ Keypad – Back-lit LCD, Copy Function, 2 lines x 20 characters

### ■ Programmable Set Point & Scaling – 24 different plain text engineering units are available, including PSI, GPH, GPM, and more

### ■ Programmable Local/ Remote – One-touch change over between local and remote

### ■ Output Power – Shows actual power consumed in kWh

### ■ Energy Cost Meter – Monitors the actual energy costs of the drive system

### ■ Programmable Sleep Mode – Protects and shuts down the pump at low speeds or in low flow conditions; It may also be activated via Building Automation Systems (BAS) input

### ■ Broken Pipe Auto Shut Down – Separate from Sleep Mode, this detects changes in motor RPM relative to sudden changes in pressure or flow, protecting against broken pipe or sudden load loss conditions.

### ■ Low & High Pressure Feedback Detection – Monitors the system feedback device to provide a warning alarm or fault based on user preset levels

### ■ Low Suction – Low Suction (Dry Well) protection protects the pump and motor from damage that would be caused if the pump were operated without liquid. The system will go to sleep and periodically wake up after user designated time delay settings to detect if liquid is available.

### ■ Automatic System Restart – Programmable timers allow the MA7200 Plus to automatically restart the system after faults relating to power loss, overvoltage and other nuisance trips.

### ■ Flow Meter Display – Through an analog input or pulse train input, a flow sensor can be connected to the drive to provide accurate flow monitoring back to the BAS.

### ■ Auxiliary PID Loop – A second set point controller (PID) is provided to control a non-drive related function.



# EQ5 Multiple Purpose Drive

## FEATURES

The EQ5 provides the functionality required for variable torque loads such as pumps and fans, as well as constant torque applications like positive displacement, screw pumps and compressors.

### ■ Horsepower

- 230 VAC, 0.25–150 hp\*
- 460 VAC, 0.5–800 hp\*

\* Variable Torque Operation

### ■ Dual Rating

- Normal Duty Rated (110% OL/ 1 Minute)
- Heavy Duty Rated (150% OL/ 1 Minute)

### ■ Two Control Methods

- Open Loop (Sensorless) Vector
- Volts/ Hertz

### ■ Motor Auto Tuning for Optimum Performance

- Full Dynamic Tuning (spinning motor)
- Static Tuning (loaded motor, not spinning)
- On-Line Tuning (continuous tuning while running)

### ■ Keypad – Graphic Back-lit LCD combined with digital LED, Copy Function, 5 lines x 13 characters

### ■ Automatic System Restart – Programmable timers allow the EQ5 to automatically restart the system after faults relating to power loss, overvoltage and other nuisance trips.

### ■ Auto Speed Search – Automatically searches for the motor, regardless of direction it is spinning, and starts controlling it without using dynamic braking

### ■ Soft Switching IGBT

- Reduced electrical noise and less voltage spiking
- Eliminates the need for output filters
- Distances up to 1,312 feet between the motor and drive are possible using the EQ5 and an inverter duty motor

### ■ Automatic Energy-Saving Operation – Minimizes drive and motor loss at light load and other functions to combine performance and energy savings which will help lower operating costs

### ■ Overvoltage Avoidance – Automatically detects regenerative conditions and adjusts the deceleration time to greatly reduce overvoltage conditions

### ■ Line to Inverter Seamless Change Over – When switching between drive and line operation, and back again, the EQ5 syncs outgoing power with line voltage, eliminating the possibility of system failure.

### ■ Inertial Power Loss Ride-Thru – Programmable 2 second or inertial power loss ride thru allows the application to continue operating using the regenerative properties and energy of the motor.



# Packaged Drive Solutions

TECO-Westinghouse provides AC drives in packaged solutions designed to meet customer specifications; from light to heavy duty applications, clean to severe environments, and more.

## PACKAGED OPTIONS

- Enclosures – NEMA 1, NEMA 12, NEMA 3R, NEMA 4, NEMA 4X & Custom enclosures
- Disconnect and Bypass Packages –
  - Disconnect Options – Circuit Breaker, Fused Disconnect
  - 2 and 3 Contactor Bypass Designs
    - Drive/ Bypass selector switch
    - Hand/ Off/ Auto selector switch
    - Normal/ Test selector switch
    - Pilot lights, 22mm LED, for control power, drive run, drive fault, bypass run, motor OL/ safety fault and smoke purge
    - Auto transfer to bypass on drive fault
    - Remote transfer to bypass via contact closure
    - Smoke purge function
    - Run mode and fault contacts
    - Control and safety circuit terminal strip
    - Damper circuit safety interlock
    - Thermal motor overload relay, class 20
    - 115 VAC control transformer, fused
    - Input circuit breaker or fused disconnects
- Multi-motor operation
- 6-Pulse with 3% or 5% AC Line Reactors
- 18 Pulse Low Harmonic Packages
- Passive and Active Harmonics Filter Packages
- MCC Systems – New Installations, Retrofit and Refurbished Packages
- Additional Engineered Solutions Available (Contact Factory for Details: 1-800-279-4007)



## TMSF ADVANCED DIGITAL SOLID STATE REDUCED VOLTAGE MOTOR STARTER

- **Horsepower**
  - 230 VAC, 5–200 hp
  - 460 VAC, 10–1,500 hp
  - 600 VAC, 15–2,000 hp
- **Protects the pumps and enhances efficiency** – Protects pumps from dry-running and cavitation; reduces maintenance costs and eliminates unplanned downtime
- **Built-in shaft power monitor** – Detects any inefficiency caused by worn-out pump impeller, a valve not fully opened, or a blocked pipe
- **Less mechanical stress on equipment** – Smooth and linear stop ramps reduce pressure; reduced mechanical stress on bearings, seals and impellers caused by water hammer
- Equipment lifetime is extended and the maintenance costs are reduced
- Torque ramp for linear acceleration
- Simple setup for the majority of applications
- Advanced setup for more demanding applications
- Complete monitoring package eliminates need for add-on devices
- Extensive protection features for motor and starter
- Rugged compact design

# Additional Vertical Capabilities

In addition to TWMC's stock VHS product line, below are our full vertical capabilities:

Type	Induction or Synchronous
Horsepower	Up to 30,000 hp
Speeds	3600 RPM, 1200 RPM and slower
Enclosures	ODP, WPII, TEFC, TEAAC, TEWAC
Frequency	60 Hz or 50 Hz
Voltages	575 to 13,800 Volts
Efficiency	NEMA Premium Efficient Designs
Ambient Temp	Greater than 40°C
Elevation	Greater than 3300 ft
Shaft	Solid or Hollow

## Other Available Options:

** AP1 541 & API 546	** API 610 Tolerances
** Low Noise Designs	** Class H Insulation
** Copper/ Copper Alloy Rotors	** Vibration Lower Than NEMA
** Stator Thermal Protection	** Custom Main Terminal Boxes
** Extra High Thrust Capacity	** Bearing Thermal Protection
** Space Heaters	** Alternate Base Diameters
** IEEE 841 For TEFC Enclosures	** Special Paint Systems
** Insulated Bearings	** Shaft Grounding Rings
** Oil Sump Heaters	** Vibration Sensors



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