

IE5 Permanent Magnet Direct Drive System Solution

DVAV / F510





Innovative Cooling Tower Direct Drive Design

It improves reliability, reduces maintenance costs, runs quieter, and improves energy efficiency

TECO has developed a low-speed and high-torque permanent magnet motor that can directly drive fans for cooling towers. In addition, the TECO cooling tower dedicated inverter control allows fans to run more quietly and consume less energy. Newly purchased and existing cooling towers can utilize the permanent magnet direct drive system for IE5 cooling towers.

The permanent magnet direct drive design reduces maintenance costs

TECO's dedicated permanent magnet direct drive system for cooling towers does not require mechanical transmission components, eliminates the need for regular reducer maintenance, and solves the problems of traditional transmission systems, including gearbox wear, transmission shaft fractures, and oil leakage. Thus, saves maintenance costs, extends product life, and reduces customer operating costs.

The addition of the special frequency converter boosts energy-saving benefits

TECO's dedicated inverter for cooling towers is specially designed to adjust software parameter settings for cooling tower applications. The energy-saving benefits of the built-in algorithm are at least 40% higher than that of general-purpose inverters and support several energy-saving technologies.

Traditional Cooling Tower

Direct Drive Cooling Tower



Permanent Magnet Direct Drive System Solution

Features

Permanent magnet motor

• The design does not include gear boxes or pulleys, therefore, there is no risk of oil leakage and shaft breakage; eliminating related maintenance costs

- It eliminates the need to align mechanical parts, speeds up installation
- Reduces maintenance frequency and improves reliability
- The motor efficiency of the high-efficiency permanent magnet motor design meets IE5 standards

• It adopts C5-M grade coating (passed salt spray tests) and uses inorganic zinc rich primer with mica iron oxide and other ingredients to achieve high corrosion resistance against high temperature, high humidity, and chlorine-containing environments

Bearings and seals

- Grease lubrication for longer service life
- Handles fan loads with greater reliability

 \circ Direct drive design provides premium motor performance with a thrust bearing rated life of up to 100,000 hours for blade loads

Inpro/Seal[®] bearing isolator



*Waterproof and dustproof up to IP66 rating, effectively blocks moisture from entering the bearing chamber

Dedicated inverter

- Buffer start functions reduce mechanical impact
- Improve system reliability and extend service life
- Noise reduction
- No encoders or resolvers are required
- Compatible with suitable drives and motors

 \circ The built-in algorithm adjusts the software parameter settings, which allows fans to run at their best performance states according to load conditions

• Automatic energy saving function (AES) can automatically adjust the optimal output voltage value, reduce the output current of the inverter according to the load, and change the output power according to the load ratio

• Built-in simple PLC and perpetual calendar functions can easily adjust loads and avoid excess energy consumption

00 80 60 40 20 0 20 40 60 80 100

Variable speed for energy saving

*The load and speed are in a cubic curve, and the speed can be adjusted according to the cooling load through the variable frequency drive, which can bring a lot of energy-saving benefits

Protocols

Metasys

When the cooling tower operation requires system automatic control and monitoring, the TECO cooling tower dedicated inverter can easily communicate with all industrial communication networks, including BACnet, Metasys N2, Modbus and other communication protocols, which can reduce installation costs.

Cost-effectiveness

Traditional cooling towers have energy loss caused by mechanical wear and maintenance costs of mechanical components. The innovative cooling tower direct drive design can improve transmission efficiency by 5~15%, effectively save energy and electricity, and save the cost of regular maintenance and periodic replacement of equipment.

In the following case, the traditional cooling tower used the "TECO IE5 special permanent magnet direct drive system for ultra-high energy efficient cooling towers" with a motor fixed frequency operation (30kW), 3,750 operating hours per year, calculated on a 5-year cycle, and resulted in an 18% savings in total operating costs.

*This case includes data from a customer with constant motor frequency operation. If an inverter is also used, the power-saving benefits can be further improved.

*The 5-year total operating cost included the periodic replacement of equipment.



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Design Standard	IEC
Voltage	380V
R.P.M. (SYN.)	Rating 200~500 R.P.M.
Output Range	5.5kW~55kW
Time Duty Continuous	Continuous Rating, S.F. 1.0 (S1)
Frame Size	Fr#180~Fr#315
Protection Enclosure	Totally Enclosed IP66
Cooling Method	IC418: Totally Enclosed Air Over
Mounting	Vertical mounting, shaft up (with D flange) V3 (IM 3031)
Place	Shadow, non-hazardous
Ambient Temperature	-15°C ~40°C
humidity	Less Than 90 % Relative Humidity (Non-Condensation)
Altitude	up to 1000 meters
Power Conditions	voltage variable does not exceed ±10%, frequency variable does not exceed ±5%. 10% Max. of Combined Voltage but frequency variable does not exceed ±5%"
Method of Starting	Controlled by Permanent Magnet Synchronous Motor Drive
Operating Conditions	Direct coupling
Frame	High grade cast iron
End Bracket	High grade cast iron
bearing	Vacuum De - Gassed High Quality Open Bearings
Stator Insulation	F class insulation
Nameplate	Stainless steel plate
temperature rise	Not to Exceed 80°C Rise (by Resistance Method at S.F.1.0 .)
Over Torque	120% Rated Torque for 60 Sec .

According your equipment requirements to choose your motor.

Frame	Fr#180	Fr#200	Fr#225	Fr#250	Fr#280	Fr#315
e						

RPM kW	200	225	250	280	300	320	360	380	400	460	480	500
5.5	#200	#200	#200	#180	#180	#180	#180	#180	#180	-	-	-
7.5	#225	#200	#200	#200	#200	#200	#180	#180	#180	#180	#180	#180
11	#250	#225	#225	#225	#225	#200	#200	#200	#200	#200	#200	#200
15	#280	#250	#250	#250	#250	#225	#225	#225	#200	#200	#200	#200
18.5	#280	#280	#280	#250	#250	#250	#250	#250	#225	#225	#225	#200
22	#315	#280	#280	#280	#280	#250	#250	#250	#250	#250	#225	#225
30	#315	#315	#315	#315	#280	#280	#280	#280	#280	#250	#250	#250
37	-	-	#315	#315	#315	#315	#280	#280	#280	#280	#280	#280
45	-	-	-	-	#315	#315	#315	#315	#315	#280	#280	#280
55	-	-	-	-	-	-	#315	#315	#315	#315	#315	#315

NOTE

Minimum cooling air velocity around motor body: 2m/s

Frame 180L

Frame 200L



SHAFT EXTENSION FRAME AS HE UB AD AG SIZE LA Μ Ρ 180L 15 300 350 294 631 18.5 193 96.5 237.5 260.5 193 M32X1.5 200L 17 350 400 18.5 327 231 115.5 259 285.5 681 231 M50X1.5

FRAME SIZE	D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
180L	48	110	100	5	36	14	42.5	51.5	M16	7311	6311C3
200L	55	110	100	5	42	16	49	59	M20	7312	6312C3

NOTE

1. Tolerance of shaft end diameter D: Fr#180L:k6 / Fr#200L:m6

2. T-Box Assy with a cable grand body.

Frame 225M

Frame 250M



(Dimension in mm)

FRAME SIZE		SHAFT EX	TENSION			AG	AS	HE	нн	L	u	UB
	LA	м	Ρ	S	AD							
225M	20	400	450	18.5	353	231	115.5	285	304.5	749	231	M50X1.5
250M	22	500	550	18.5	395	255	127.5	318.5	342.5	825	255	M63X1.5

FRAME SIZE	D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
225M	60	140	125	7.5	42	18	53	64	M20	7313	6313C3
250M	65	140	125	7.5	42	18	58	69	M20	7315	6315C3

NOTE

1. Tolerance of shaft end diameter D: m6

2. T-Box Assy with a cable grand body.

Frame 280M

Frame 315L



(Dimension in mm)

		SHAFT EX	TENSION									
FRAME SIZE	LA	м	Ρ	S	AD	AG	AS	HE	нн	L	LL	UB
280M	22	500	550	18.5	443	255	127.5	366.5	399.5	939	255	M63X1.5
315L	25	600	660	24	511	336	168	420	522	1216	322	M63X1.5
FRAME SIZE	D	E	EB	EF	E	G	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
280M	75	140	125	7.5	4	0	20	67.5	79.5	M20	7318	6316C3

NOTE

315L

1. Tolerance of shaft end diameter D: m6

80

170

160

5

40

22

71

85

M20

7320

6316C3

2. T-Box Assy with two cable grand bodies.

Outline Dimension Sheet Inverter F510 - 400V











F !	EDANAE	Catala a Na			Dime	nsions ((mm)			Protection	Applicable	Rated
Fig.	FRAIVIE	Catalog No.	w	н	D	W1	H1	t	d	Enclosure	(kW)	Current(A)
		F510-2001-□										
		F510-2002-□										
	Frame	F510-2003-□	420	245	450	440	203	-			0.74	3.4
	1	F510-4001-□3	130	215	150	118		5	1015		1.48 2.22	4.1 5.4
		F510-4002-□3										514
А		F510-4003-□3								1020		
		F510-2005-□3								IP20		
		F510-2008-□3	140				267					
	Frame	F510-2010-□3		270 5	181	122		1.2	M6		3.7	9.2
	2	F510-4005-□3		279.5		122		1.2			5.55	12.1
		F510-4008-□3									714	1710
		F510-4010-□3										
		F510-2015-□3	210		215							
	Frame	F510-4015-□3		300		102	200	1.0	MC		11.1	23
	3	F510-4020-□3				192	200	1.6	IVIO		14.8	31
		F510-4025-□3									10.0	30
В		F510-2020-□3					340	1.6	M8	IP20		
		F510-2025-□3										
	Frame 4	F510-2030-□3	265	360	225	245					22.2	44 58
		F510-4030-□3									29.0	50
		F510-4040-□3										
		F510-2040-□3										
		F510-2050-□3										
C	Frame	F510-4050-□3		E26	272	160	FOF	2.2	N40	1020	37	73
Ľ	5	F510-4060-□3	288	520	272	100	505	5.5	IVI8	120	44.4	88 103
		F510-4075-□3									0010	200
		F510-4100-□3										9



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