VARIABLE SPEED MOTORS

Air cooled condenser motor and drive system

For industrial applications

BALDOR • RELIANCE

New air cooling drive technology
Improves reliability, reduces maintenance, runs quieter and saves energy

ABB offers high-torque direct drive motors for air cooled condenser applications by combining the technologies of the field-proven and power-dense AC laminated frame. Baldor-Reliance® RPM AC motors have high performance permanent magnet (PM) salient pole rotor designs and the matched performance of an adjustable speed drive. The direct drive solution offers the benefits of variable speed control and eliminates the cost and maintenance required for traditional gearboxes. The fan couples directly to the motor and is controlled by a unique AC drive to provide optimal speed and air cooled condenser performance that runs quieter with reduced energy consumption. The drive is designed to accommodate the most common industrial communications protocols.

Direct drive RPM AC synchronous PM motor reduces maintenance costs
The RPM AC synchronous PM motor uses laminated finned frame construction to provide a highly efficient power dense package with flange mounting dimensions that can replace the gearbox in many conventional air cooled condenser applications. RPM AC is the right solution for operation inside the cooled condenser's hot and dirty environment. The DPG-FV (drip- proof guarded force ventilated) and TEAO (totally enclosed air over) RPM AC air cooled condenser motor is designed for minimal maintenance. Bearings require lubrication only once per year. The electrical insulation system is manufactured using a VPI (vacuum pressure impregnation) process that ensures long life even in the most extreme environmental conditions. Condensation drains relieve any moisture that may collect inside the motor. No more changing gear oil or gear boxes.

ABB ACS880 air cooled condenser drive
The ABB ACS880 cooling condenser drive utilizes our Matched Performance philosophy to ensure trouble-free operation with the Baldor-Reliance RPM AC permanent magnet air cooled condenser motor. The drives also provide custom features for the air condenser industry including trickle current motor heating, locked motor rotor functionality to prevent windmilling when not enabled, de-ice mode, accelerometer feedback and RTD temperature feedback. Additionally, much complexity is reduced in the air cooled condenser drive by removing all general purpose drive parameters and only providing the necessary air cooled condenser drive parameters, allowing for easy configuration and start-up. The ABB air cooled condenser drive also provides a quick start assistance specifically for air cooled condenser tower applications making start-up simple and straightforward.

RPM AC direct drive air cooled condenser tower

Features and benefits

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01 Air cooled condenser motor FL5800 frame
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02 ABB drive ACS880

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Direct drive motor

- Eliminates the need for a gearbox and coupling
- Reduces maintenance and provides improved reliability
- Eliminates contamination by eliminating gearbox oil and leakage
- Reduces power consumption
- Results in increased safety due to removal of rotating equipment
- Eliminates the alignment of mechanical components for quicker installation
- Reduce installation cost and increased system efficiency

Bearing and seals

- Oversized bearings to maintain longer bearing life exceeding L_{10} 100,000 hours
- Tapered roller pair on opposite drive end and deep groove ball bearing on drive end
- Optional carrier bearing design with greater clearance: Only functions when the motor sees wind gusts greater than 50 mph
- Mobil SHC460 synthetic grease lubrication for long life
- Handles fan loads with improved reliability

Motor features

- Thermostats one per phase normally closed
- Heavy build external paint coating
- Proven insulation system technology used in offshore drilling applications
- Insulated opposite drive end bearing on FL440 and FL5800 frames (FL5800 also has insulated bearing on drive end)

RPM AC direct drive air cooled condenser tower

Adjustable speed control

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01 TEAO enclosure running in ACC application

- Designed specifically for the air cooled condenser industry and can be set at optimum speed point (+N5350)
- Sensor less permanent magnet motor control operates without an encoder or resolver
- Trickle heating eliminates need for motor space heaters
- Guaranteed compatibility due to the matched performance of the motor drive
- Allows for a soft start (controlled ramp)
- Saves energy and reduces mechanical stress on the system 30-60%
- Improves system reliability and extends life
- Reduces noise
- Trickle current for braking prevents fan windmilling when not in operation
- System resonance speed can be bypassed
- Optional drive care warranty provides a five-year warranty on the drive with a preventative maintenance on the drive at three years

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Retrofit or new tower designs

A direct drive motor eliminates components by mounting the fan directly on the motor shaft.

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01 Conventional tower design – motor and gear box
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02 New direct drive tower design – DPFV FL5800 frame
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03 TEAO enclosure, FL4421

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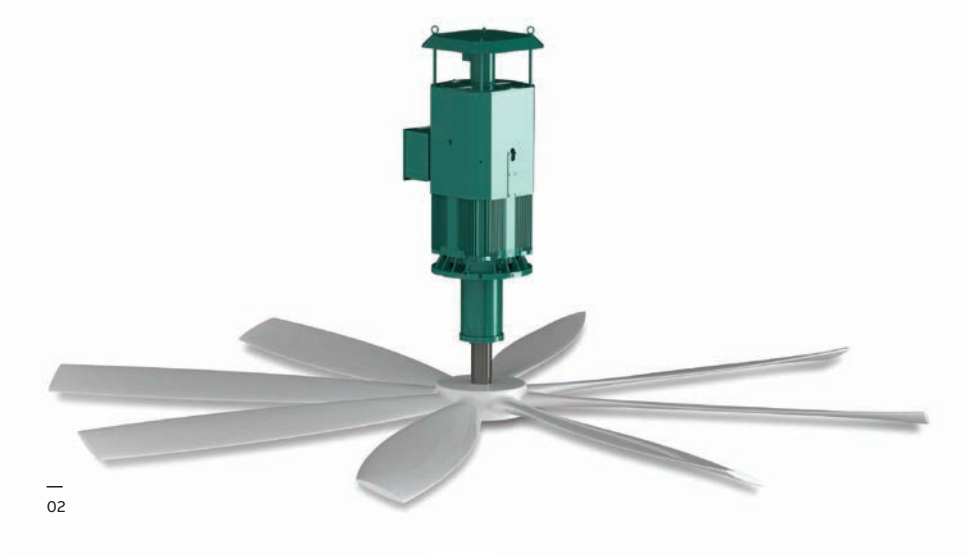
01



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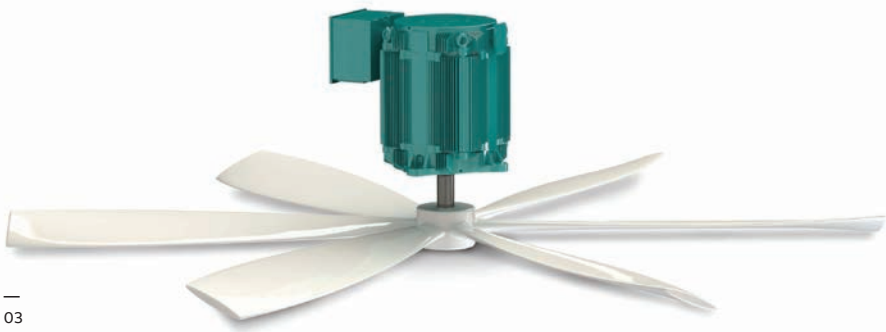

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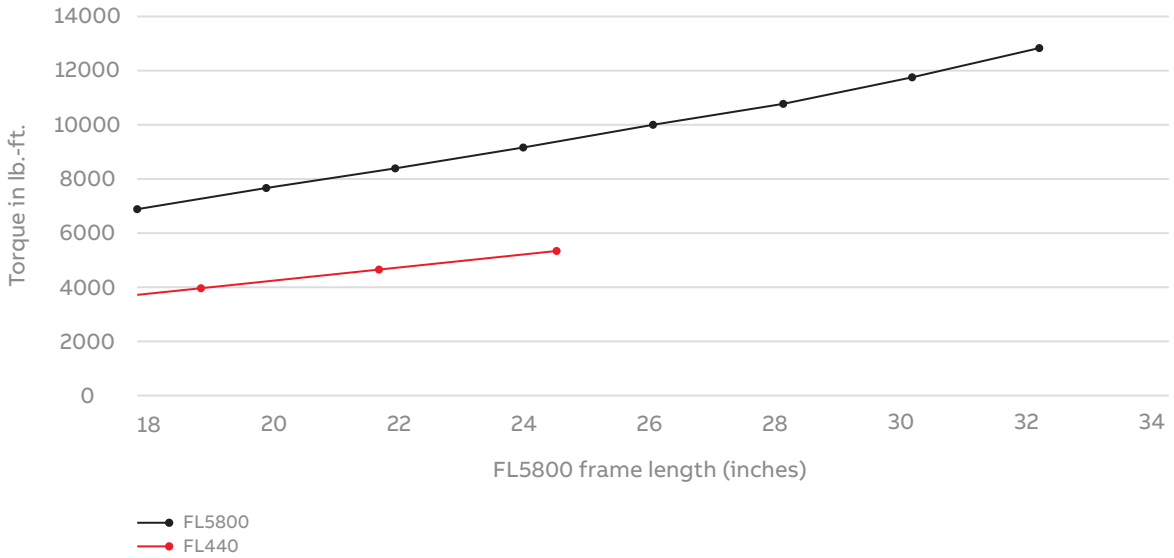
03

Air cooled condenser frame

Air cooled condenser motor matrix

Hp	RPM					
	70	80	90	100	110	120
250	-	-	-	-	FL5832	FL5830
200	-	-	FL5830	FL5828	FL5826	FL5824
175	-	FL5830	FL5828	FL5826	FL5822	FL5822
150	FL5830	FL5826	FL5824	FL5822	FL5820	FL5818
125	FL5826	FL5822	FL5820	FL5818	FL5818	FL5818
100	FL5820	FL5818	FL5818	FL4451	FL4451	FL4440
90	FL5818	FL5818	FL4451	FL4451	FL4440	FL4429
80	FL5818	FL4451	FL4451	FL4440	FL4429	FL4421
70	FL4451	FL4440	FL4440	FL4429	FL4421	FL4413
60	FL4440	FL4429	FL4421	FL4421	FL4413	FL4413
50	FL4429	FL4421	FL4413	FL4413	FL4413	FL4413

Air cooled condenser, max torque per frame length

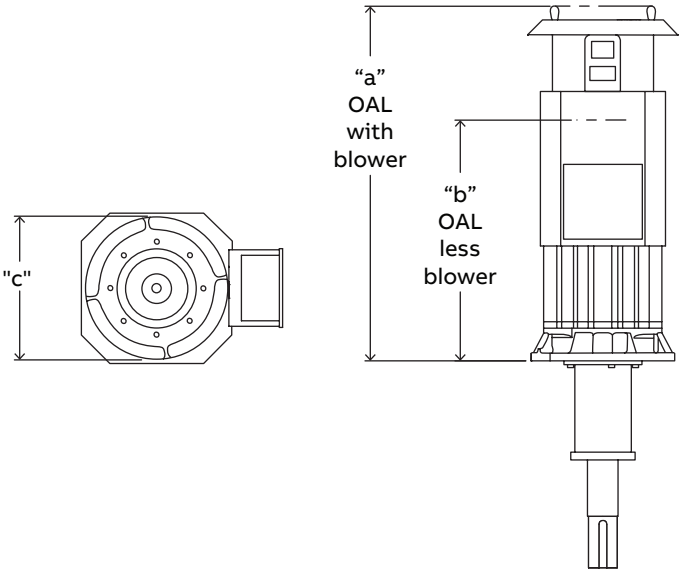


RPM AC air cooled condenser motor
Dimensions - DPFV FL440, FL5800 frame

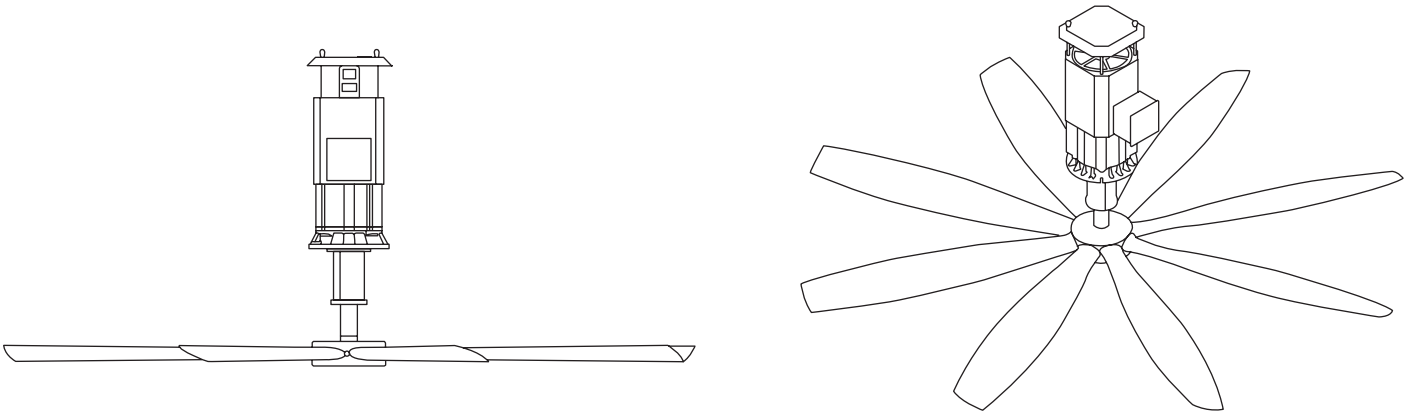
Typical shaft down ACC DPFV motor dimensions

Frame size	"a"	"b"	"c"	Wt. lbs. (kgs.)
FL4413Y	58.2 (1478)	33.3 (846)	26.6 (675)	2815 (1277)
FL4421Y	60.2 (1529)	35.3 (897)	26.6 (675)	3030 (1375)
FL4429Y	62.2 (1580)	37.3 (947)	26.6 (675)	3240 (1470)
FL4440Y	64.9 (1649)	40.0 (1016)	26.6 (675)	3530 (1602)
FL4451Y	67.4 (1712)	42.8 (1087)	26.6 (675)	3830 (1738)
FL5814Y	66.4 (1687)	40.1 (1019)	36.0 (914)	4555 (2066)
FL5816Y	68.4 (1737)	42.1 (1069)	36.0 (914)	4910 (2227)
FL5818Y	70.4 (1788)	44.1 (1120)	36.0 (914)	5265 (2388)
FL5820Y	72.4 (1839)	46.1 (1171)	36.0 (914)	5620 (2549)
FL5822Y	74.4 (1890)	48.1 (1222)	36.0 (914)	5975 (2710)
FL5824Y	76.4 (1941)	50.1 (1273)	36.0 (914)	6330 (2871)
FL5826Y	78.4 (1991)	52.1 (1323)	36.0 (914)	6685 (3032)
FL5828Y	80.4 (2042)	54.1 (1374)	36.0 (914)	7040 (3193)
FL5830Y	82.4 (2093)	56.1 (1425)	36.0 (914)	7395 (3354)
FL5832Y	84.4 (2144)	58.1 (1476)	36.0 (914)	7750 (3515)

Dimensions in inches (millimeters)



Shaft down ACC DPFV motor detail with typical fan

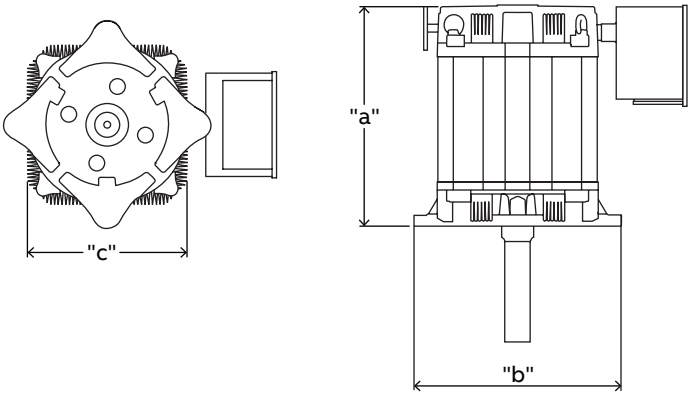


RPM AC air cooled condenser motor
Dimensions TEAO FL360, FL400 & FL440 frame

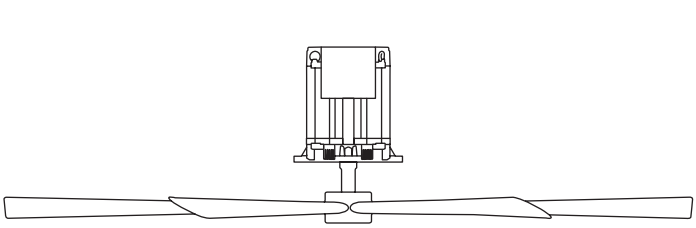
Typical shaft down ACC DPFV motor dimensions

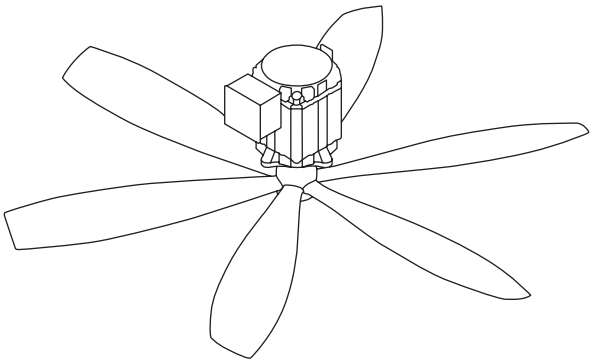
Frame size	"a"	"b"	"c"	Wt. lbs. (kgs.)
FL3698Y	24.43 (620.5)	28.15 (715.0)	17.60 (447.0)	1595 (723)
FL3614Y	28.43 (722.1)	28.15 (715.0)	17.60 (447.0)	1870 (848)
FL4022Y	26.44 (671.6)	28.15 (715.0)	19.56 (496.8)	19000 (862)
FL4034Y	29.44 (747.8)	28.15 (715.0)	19.56 (496.8)	2160 (980)
FL4046Y	32.44 (824.0)	28.15 (715.0)	19.56 (496.8)	2420 (1098)
FL4058Y	35.44 (900.2)	28.15 (715.0)	19.56 (496.8)	2680 (1216
FL4413Y	27.84 (707.1)	28.15 (715.0)	21.65 (550.0)	2660 (1207)
FL4421Y	29.84 (757.9)	28.15 (715.0)	21.65 (550.0)	2855 (1295)
FL4429Y	31.84 (808.7)	2815 (715.0)	21.65 (550.0)	3145 (1427)
FL4440Y	34.59 (878.6)	28.15 (715.0)	21.65 (550.0)	3450 (1565)
FL4451Y	37.34 (948.4)	28.15 (715.0)	21.65 (550.0)	3800 (1724)

Dimensions in inches (millimeters)



Shaft down motor detail with typical fan





Adjustable speed drive cooling tower
Models

Drive Specifications				
Hp	**Type**	**Full load amps**	**Frame**	**Catalog number**
230Vac Drives (range 208 to 240 V)				
7.5	Industrial	23.1	R2	ACS880-01-24A3-2+N5350
10	Industrial	29.3	R3	ACS880-01-031A-2+N5350
15	Industrial	44.0	R4	ACS880-01-046A-2+N5350
20	Industrial	58.0	R4	ACS880-01-061A-2+N5350
25	Industrial	71.0	R5	ACS880-01-075A-2+N5350
30	Industrial	83.0	R5	ACS880-01-087A-2+N5350
40	Industrial	109.0	R6	ACS880-01-115A-2+N5350
50	Industrial	138.0	R6	ACS880-01-145A-2+N5350
60	Industrial	162.0	R7	ACS880-01-170A-2+N5350
75	Industrial	196.0	R7	ACS880-01-206A-2+N5350
100	Industrial	260.0	R8	ACS880-01-274A-2+N5350
460Vac Drives (range 380 to 500 V)				
7.5	Industrial	11.0	R1	ACS880-01-11A0-5+N5350
10	Industrial	14.0	R2	ACS880-01-014A-5+N5350
15	Industrial	21.0	R2	ACS880-01-021A-5+N5350
20	Industrial	27.0	R3	ACS880-01-027A-5+N5350
25	Industrial	34.0	R3	ACS880-01-034A-5+N5350
30	Industrial	40.0	R4	ACS880-01-040A-5+N5350
40	Industrial	52.0	R4	ACS880-01-052A-5+N5350
50	Industrial	65.0	R5	ACS880-01-065A-5+N5350
60	Industrial	77.0	R5	ACS880-01-077A-5+N5350
75	Industrial	96.0	R6	ACS880-01-096A-5+N5350
100	Industrial	124.0	R6	ACS880-01-124A-5+N5350
125	Industrial	156.0	R7	ACS880-01-156A-5+N5350
150	Industrial	180.0	R7	ACS880-01-180A-5+N5350
200	Industrial	240.0	R8	ACS880-01-240A-5+N5350
250	Industrial	302.0	R9	ACS880-01-302A-5+N5350
575Vac Drives (525 to 690 V)				
7.5	Industrial	9.0	R5	ACS880-01-07A3-7+N5350
10	Industrial	11.0	R5	ACS880-01-09A8-7+N5350
15	Industrial	17.0	R5	ACS880-01-14A2-7+N5350
20	Industrial	22.0	R5	ACS880-01-018A-7+N5350
25	Industrial	27.0	R5	ACS880-01-022A-7+N5350
30	Industrial	32.0	R5	ACS880-01-026A-7+N5350
40	Industrial	41.0	R5	ACS880-01-035A-7+N5350
50	Industrial	52.0	R5	ACS880-01-042A-7+N5350
60	Industrial	62.0	R6	ACS880-01-061A-7+N5350
75	Industrial	77.0	R6	ACS880-01-084A-7+N5350
100	Industrial	99.0	R7	ACS880-01-098A-7+N5350
125	Industrial	125.0	R7	ACS880-01-119A-7+N5350
150	Industrial	144.0	R8	ACS880-01-142A-7+N5350
200	Industrial	192.0	R8	ACS880-01-174A-7+N5350
250	Industrial	242.0	R6	ACS880-01-210A-7+N5350

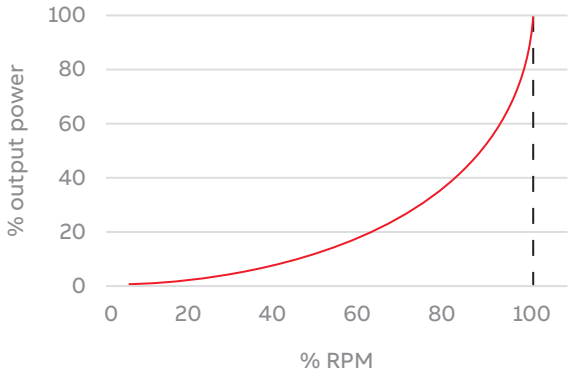
Optimized air cooling condenser tower
Energy savings even under low load conditions

By optimizing motor speed, considerable energy can be saved. The entire air cooling condenser system must be designed for the "worst case" (or highest air flow) scenario. For optimum system performance, the fan may need to operate at reduced speed.

As the speed of the motor is decreased, the air flow drops in a corresponding linear fashion. So, for example, if the motor runs at only 50 percent speed, the air flow is correspondingly reduced to 50 percent of maximum air flow.

However, the input power to the motor varies with the cube of the motor speed. For example, if a motor is run at half speed, the power consumed by the motor is 12.5 percent, or 1/8 [I,e. $(1/2)^3$] of the power consumed at full speed. So, if the needed airflow can be achieved by running at half speed, it is possible to save a large amount of energy (see energy chart on the right).

Adjustable speed saves energy



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