



4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

FEATURES & BENEFITS

- The permanent magnet synchronous motor provides superior efficiency, excellent energy savings and strong reliability.
- Instead of a short-circuit induction type rotor, the high efficiency motor contains a permanent magnet rotor design with buried magnets and magnetic core segments.
- The permanent magnet motor design eliminates electrical rotor losses resulting in lower motor amps, improved partial load behavior and reduced temperature heat rise.
- The PM motor has a lower weight, a reduced length and requires lower Amps to run at the same pump load.
- For operation with Variable frequency drive (VFD)
- NEMA mounting design with metric studs
- Stainless steel splined shaft
- StatorShield™ - Franklin encapsulation system: Franklin Electric encapsulated motors are equipped with hermetically-sealed windings. The stator resin mechanically supports the winding and provides fast heat dissipation.
- Hydrodynamic liquid lubricated radial bearings and High capacity Kingsbury type thrust bearing for 100 % maintenance free operation
- Field replaceable round plug lead using Franklin's exclusive Water Bloc technology with extended jam nut in Stainless steel
- Pressure-equalizing diaphragm (only in 6500N motors)
- Stator shell in 316SS (suitable for use in water with increased salinity)
- Factory filled with FES Franklin's non-toxic water soluble fill solution
- Drinking water approvals



High efficiency electrical design for low operation costs

The permanent magnet synchronous motor provides superior efficiency, excellent energy savings and strong reliability.

Reduced motor length and weight

The PM motor has a lower weight, a reduced length and requires lower Amps to run at the same pump load.

Permanent Magnet Technology

Instead of a short-circuit induction type rotor, the high efficiency motor contains a permanent magnet rotor design with buried magnets and magnetic core segments.

STANDARD SPECIFICATION

- Ratings 0.55 - 3.0 kW (Thrust load: 4 kN)
3.0 - 7.5 kW (Thrust load: 6.5 kN)
- Standard voltage: 220V / 380V (100 Hz - 3000 rpm, 120 Hz - 3600 rpm)
- Voltage tolerance U_N : $\pm 10\%$
- Max. storage temperature: 0 °C - +50 °C
- Nominal ambient temperature: 30 °C (with 0.08 m/s cooling flow)
- protection IP68
- insulation class B
- Protection requirements: DIN/EN 60947-4-1
- Frequency of starts: 20 starts/ hour (with min. 3 minutes resting time), equally distributed
- All motors with factory installed leads (≤ 2.2 kW: 1.50 m; ≥ 3 kW: 2.50 m)
- Vertical and horizontal operation, shaftend heightend
- Rotation counter clock wise facing shaft end (rotation reversible for 3 phase motors)

OPTIONS

- Higher-graded material: 316SS
- 120 Hz electrical design
- Special lead lengths



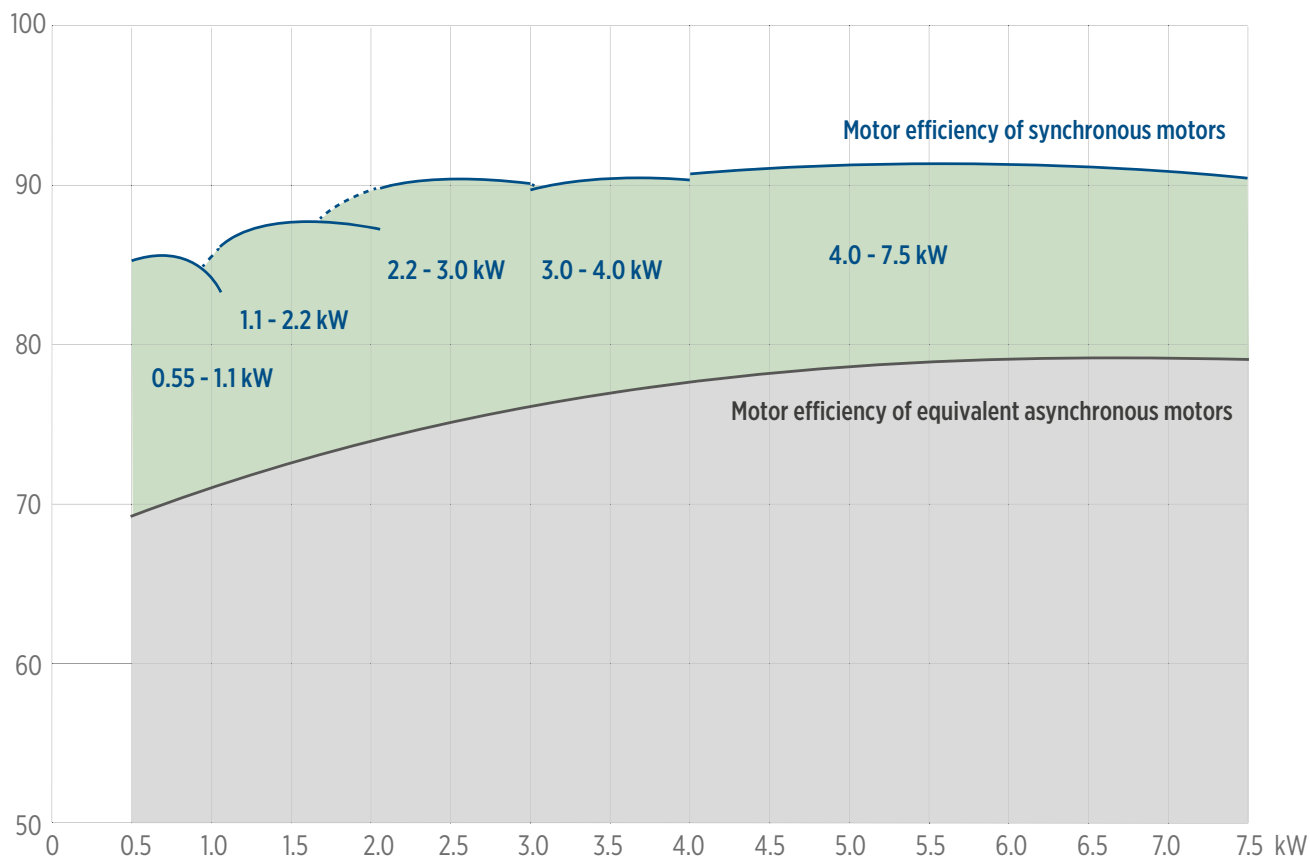
No electrical rotor losses

The permanent magnet motor design eliminates electrical rotor losses resulting in lower motor amps, improved partial load behavior and reduced temperature heat rise.



4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

efficiency [%]



permanent magnet technology



Energy savings with
High Efficiency System



Explainer video
High Efficiency System



4" High Efficiency System



High Efficiency System



Variable Frequency drives
& Accessories

4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

4CT PM MOTOR - 3-PHASE - MOTOR MODEL NO. | 220V | 100-120 HZ | 304SS | 316SS

P _N [kW]	U _N [V]	Thrust F [N]	f [Hz]	Digit 1 - 6	Digit 7 - 10	
					304SS Single pack with lead*	316SS Single pack with lead*
0.55 - 1.1	220	4000	100	234 071	6721L	6821L
			120	234 051		
1.1 - 2.2	220	4000	100	234 072	6721L	6821L
			120	234 052		
2.2 - 3.0	220	4000	100	234 073	6721L	6821L
			120	234 053		
3.0 - 4.0	220	6500	100	234 074	3421L	3521L
			120	234 054		

4CT PM MOTOR - 3-PHASE - MOTOR MODEL NO. | 380V | 100 HZ | 304SS | 316SS

P _N [kW]	U _N [V]	Thrust F [N]	Digit 1 - 6	Digit 7 - 10	
				304SS Single pack with lead*	316SS Single pack with lead*
1.1 - 2.2	380	4000	234 062	6721L	6821L
2.2 - 3.0	380	4000	234 063	6721L	6821L
3.0 - 4.0	380	6500	234 064	3421L	3521L
4.0 - 7.5	380	6500	234 066	3421L	3521L

*lead lengths motors: "L" : with pre-mounted cable 1.50 m | 6500N: 2.50 m

PM motors must be operated with a variable frequency drive (VFD).

4CT PM MOTOR - 3-PHASE - MOTOR PERFORMANCE DATA | 220V | 100 HZ

System model no.	motor model no.	P _N [kW]	Thrust F [N]	U _N [V]	n _N [min ⁻¹]	I _N [A]	I _A /I _N [A]	η [%]	cos phi	T _N [Nm]	T _A /T _N [*] [Nm]
308 071 001	234 071 ***	0.55	4000	220	3000	1.8	1	85.1	0.95	1.8	1
		0.75				2.4		85.6	0.97	2.4	
		1.1				3.8		83.5	0.99	3.5	
308 072 001	234 072 ***	1.1	4000	220	3000	3.4	1	86.4	0.96	3.5	1
		1.5				4.8		88.0	0.97	4.8	
		2.2				7.0		87.0	0.99	7.0	
308 073 001	234 073 ***	2.2	4000	220	3000	6.9	1	90.3	0.96	7.0	1
		3.0				9.4		90.2	0.97	9.6	
308 074 001	234 074 ***	3.0	6500	220	3000	10.2	1	90.7	0.94	9.6	1
		3.7				12.0		91.0	0.96	11.8	
		4.0				13.0		91.0	0.97	12.7	

4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

4CT PM MOTOR - 3-PHASE - MOTOR PERFORMANCE DATA | 380V | 100 HZ

System model no.	motor model no.	P _N [kW]	Thrust F [N]	U _N [V]	n [min ⁻¹]	I _N [A]	I _A /I _N [A]	η [%]	cos phi	T _N [Nm]	T _A /T _N * [Nm]
308 062 00X	234 062 ***	1.1	4000	380	3000	2.2	1	86.4	0.95	3.5	1
		1.5				2.8		88.0	0.96	4.8	
		2.2				4.0		87.0	0.97	7.0	
308 063 00X	234 063 ***	2.2	4000	380	3000	4.0	1	89.6	0.95	7.0	1
		3.0				5.4		90.0	0.97	9.6	
308 064 00X	234 064 ***	3.0	6500	380	3000	5.7	1	89.7	0.96	9.6	1
		3.7				6.7		90.2	0.97	11.8	
		4.0				7.3		90.2	0.98	12.7	
308 066 00x	234 066 ***	4.0	6500	380	3000	7.3	1	90.7	0.95	12.7	1
		5.5				9.7		91.0	0.95	17.5	
		7.5				13.1		90.5	0.96	23.9	

Performance data are based on measurements with Franklin Electric original equipment.

*Since this is an integrated system (motor and electronics), these specifications refer to the VFD input.

HIGH EFFICIENCY

4CT PM MOTOR - 3-PHASE - WINDING RESISTANCE DATA | 220V | 60 HZ

P _N [kW]	U _N [V]	stator reference no.	U - V [Ohm]	rotor reference no.
0.55 - 1.1	220	327 460 ***	7.7 - 8.14	178 172 901
1.1 - 2.2	220	327 461 ***	2.30 - 2.40	178 172 903
2.2 - 3.0	220	327 462 ***	1.45 - 1.54	178 172 904
3.0 - 4.0	220	327 463 ***	0.78 - 0.82	178 173 921

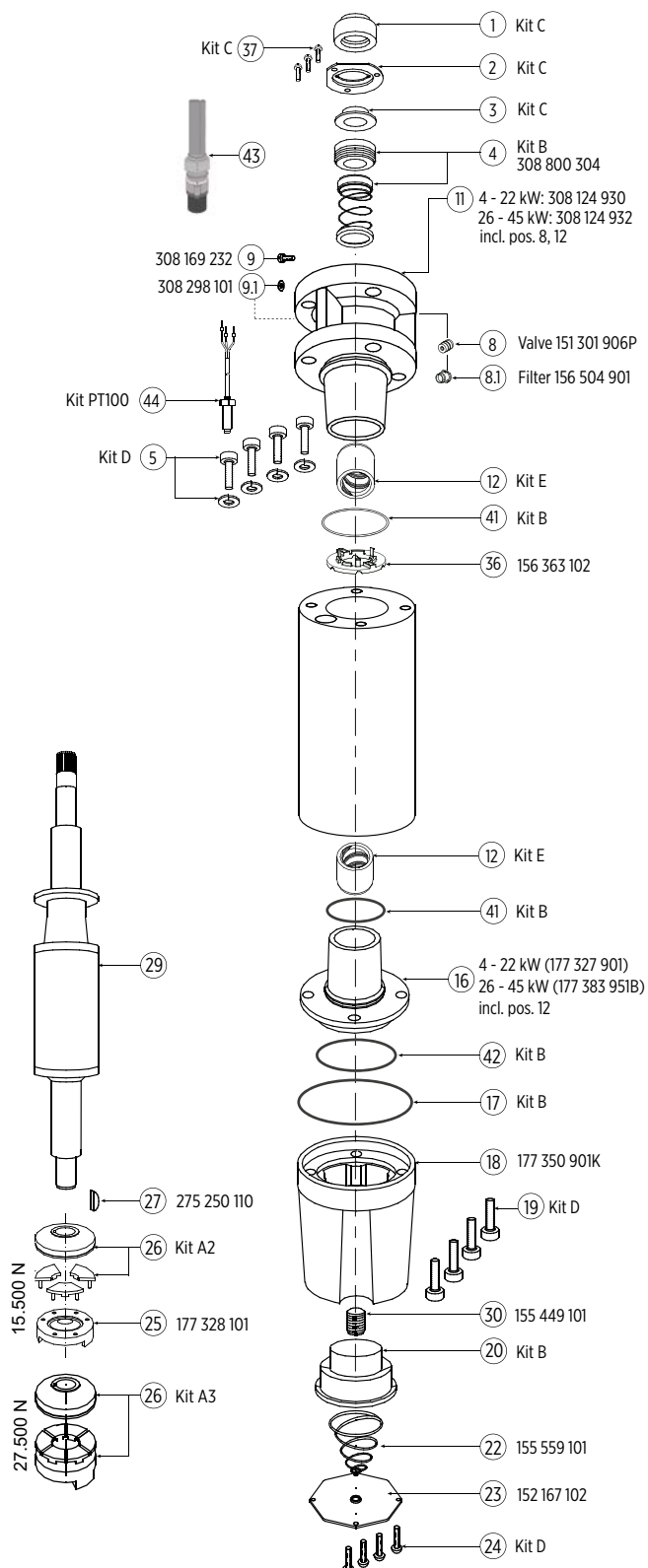
4CT PM MOTOR - 3-PHASE - WINDING RESISTANCE DATA | 380V | 100 HZ

P _N [kW]	U _N [V]	stator reference no.	U - V [Ohm]	rotor reference no.
1.1 - 2.2	380	327 451 ***	8.0 - 8.4	178 172 903
2.2 - 3.0	380	327 452 ***	4.4 - 4.62	178 172 904
3.0 - 4.0	380	327 453 ***	2.7 - 2.9	178 173 921
4.0 - 7.5	380	327 454 ***	1.88 - 2.07	178 141 901

4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

4CT PM MOTOR - 3-PHASE - MOTOR PART DESCRIPTION | 0.55 - 3.0 KW | 4000N

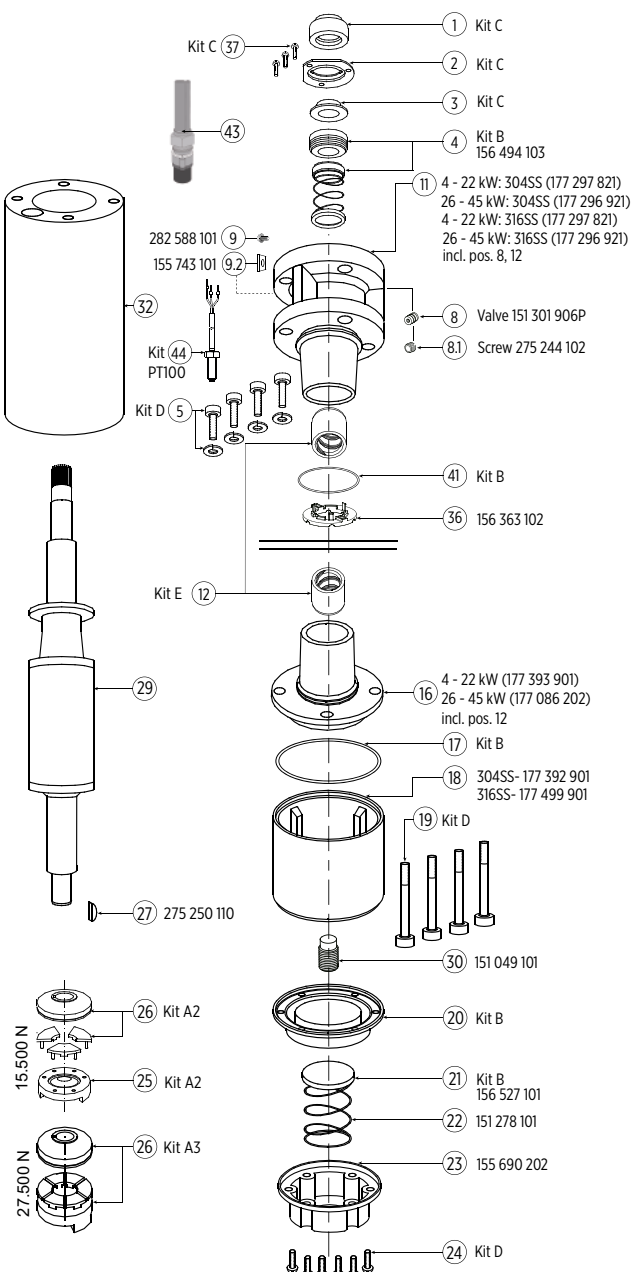
HIGH EFFICIENCY



Pos.	part description	qty.	part no.
1	nut M8	4	Kit C
2	stud M8	4	Kit C
3	protector (spline)	1	Kit B
4	connector boss	1	Kit A1 151820103
5	motor lead	1	cf. section
6	washer	1	Kit B
7	top endbell, cover 304SS	1	Kit A1 150262151
	top endbell, cover 316SS	1	Kit A1 150262251
8	plug	1	Kit B
9	filter	1	Kit B
10	valve	1	Kit A
11	shaft seal	1	Kit B
12	top endbell	1	Kit A
13	O-ring	1	Kit B
14	rotor	1	cf. section
15	stator	1	cf. section
16	level washer	1	Kit A
17	thrust disc assy	1	Kit A
18	O-ring	1	Kit B
19	bottom endbell	1	Kit A2
20	bearing cage	1	Kit A
21	segments	3	Kit A
22	rocking disc	1	Kit A
23	diaphragm washer	1	Kit B 151314101
24	diaphragm	1	Kit B
25	bottom endbell cover 304SS	1	156 414 201
	bottom endbell cover 316SS		156 414 301
26	screw, cover	3	Kit C

4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

4CT PM MOTOR - 3-PHASE - MOTOR PART DESCRIPTION | 3.0 - 7.5 KW | 6500N



Pos.	part description	qty.	part no.
1	protector, spline	1	Kit B
2	washer	1	Kit B
3	stud	4	Kit C
4	nut	4	Kit C
5	seal cover	1	Kit D
6	shaft seal	1	Kit B+D
7	connector boss	1	Kit D
8	top endbell, cover	1	Kit D
9	O-ring	1	Kit B+D
10	top endbell	1	Kit D
11	upthrust washer	1	Kit
12	rotor	1	<i>cf. section</i>
13	stator	1	<i>cf. section</i>
14	woodruff key	1	275 250 104
15	bottom endbell	1	Kit
16	O-ring	1	Kit B
17	thrust disc	1	Kit A
18	segment	1	Kit A
19	leveling disc	1	155 660 101
20	adjusting screw	1	151 048 103
21	screws	3	Kit C
22	thrust housing	1	177 378 901
23	diaphragm	1	Kit B
24	spring	1	151 449 101
25	cover, diaphragm	1	155 647 101
26	screws	6	Kit C
27	cup spring, diaphragm	1	151 448 101
29	sealing stopper	1	Kit B+D
30	seal	1	Kit D
31	filter	1	Kit B+D
32	motor lead	1	<i>cf. section</i>
33	sand slinger (316SS)	1	Kit B
34	seal cover (316SS)	1	Kit B
35	ring	1	Kit B
36	spring ring	1	Kit B
37	support disc seal	1	Kit B

HIGH EFFICIENCY

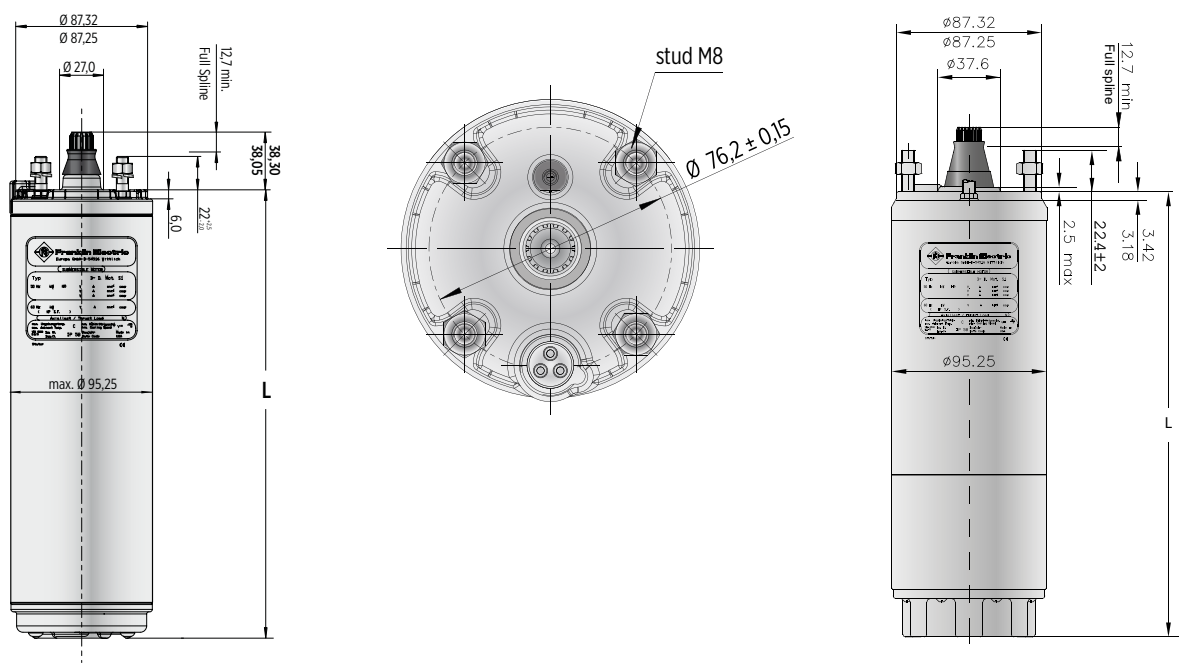
4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

4CT PM MOTOR - 3-PHASE - DIMENSIONS AND WEIGHTS

0.55 - 3.0 kW [4000 N]

3.0 - 7.5 kW [6500 N]

HIGH EFFICIENCY



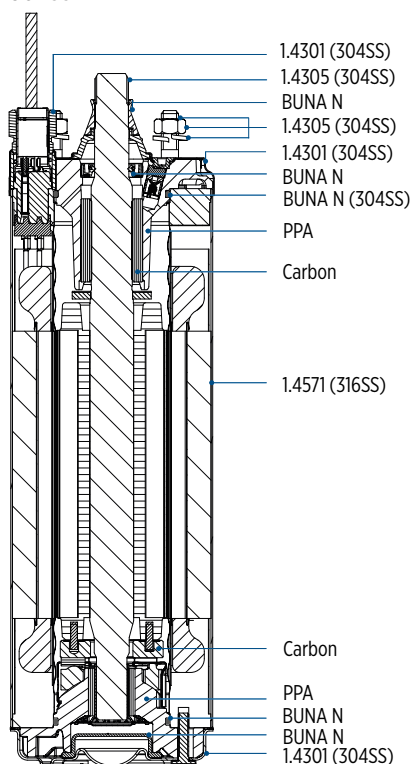
P _N [kW]	U _N [V]	Thrust F [N]	L [mm]	M [kg]	Single pack with lead*	
					[mm]	[kg]
0.55 - 1.1	220	4000	218	5.2	530 x 100 x 110	6
1.1 - 2.2	220	4000	263	7.2	530 x 100 x 110	8
2.2 - 3.0	220	4000	353	9.2	560 x 100 x 110	10
3.0 - 4.0	220	6500	429	15.2	560 x 100 x 110	16
1.1 - 2.2	380	4000	263	7.2	560 x 100 x 110	8
2.2 - 3.0	380	4000	353	9.2	560 x 100 x 110	10
3.0 - 4.0	380	6500	429	15.2	796 x 100 x 110	16
7.5	380	6500	531	19.8	796 x 100 x 110	20

Tolerances according to NEMA MG 1-18.388

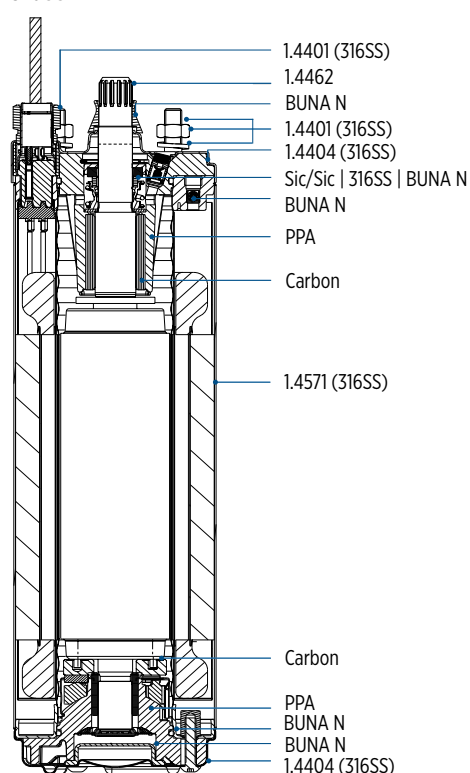
4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

4CT PM MOTOR - 3-PHASE - MATERIALS | 4000N

304SS



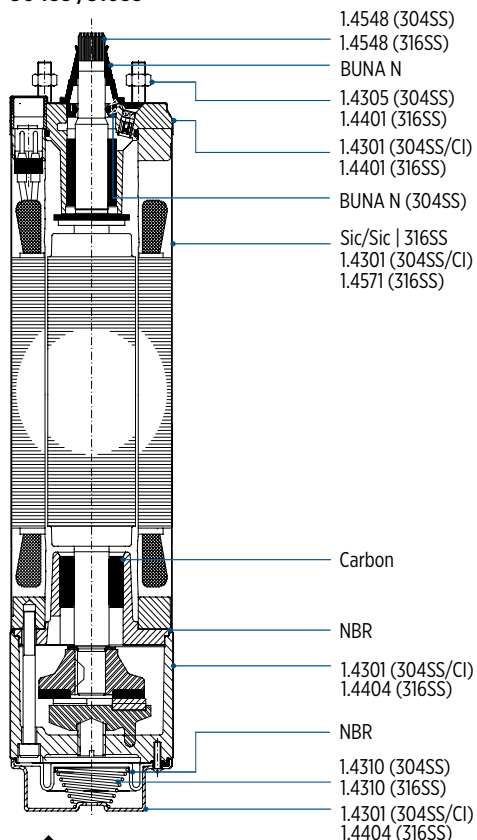
316SS



HIGH EFFICIENCY

4CT PM MOTOR - 3-PHASE - MATERIALS | 6500N

304SS / 316SS



4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

4CT PM MOTOR - 3-PHASE - MOTOR SPARE PARTS - KITS | 4000N

Kit	description	included positions	part no.
Kit A1	upper end bell 304SS	4, 7 - 13	308 462 901
	upper end bell 316SS		308 462 951
Kit A2	lower end bell incl. thrust bearing kit 4000N	16 - 22	308 464 911
Kit B	seal kit Standard 304SS	3, 6, 8, 9, 11, 13, 18, 23	308 650 201
	seal kit Standard 316SS		308 650 251
Kit C	fastener kit 304SS	1, 2, 26	308 656 201
	fastener kit 316SS		308 656 251

4CT PM MOTOR - 3-PHASE - MOTOR SPARE PARTS - KITS | 6500N

Kit	description	included positions	part no.
Kit A	thrust bearing kit 6500N	17, 18	308 700 301
Kit B	seal kit 304SS	1, 2, 6, 9, 16, 23, 29, 31	308 900 351
	seal kit 316SS	6, 9, 16, 23, 34, 36	308 900 302
Kit D	fastener kit 304SS	3, 4, 21, 26	308 658 351
	fastener kit 316SS		308 658 301

P _N [kW]	material	upper end bell (Pos. 10)	lower end bell (Pos. 15)	upthrust washer (Pos. 11)
3.0 - 7.5	304SS	308 233 509	177 379 921	308 268 104
3.0 - 4.0	316SS	177 390 957	177 390 957	308 747 101
4.0 - 7.5	316SS	177 390 959	177 379 901	275 540 163

4CT PM MOTOR - 3-PHASE - STATOR AND ROTOR | 0.55 - 4 KW | 220V

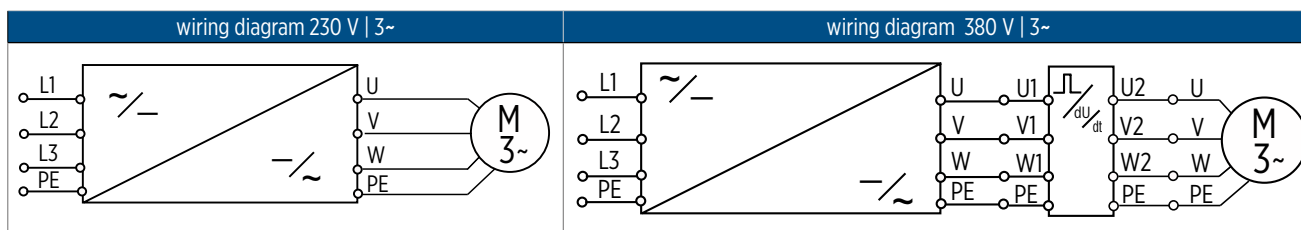
P _N [kW]	U _N [V]	Thrust F [N]	model no.	model no. stator	model no. rotor
0.55 - 1.1	220	4000	234 071 ****	305 491 951	178 172 901 K
1.1 - 2.2	220	4000	234 072 ****	305 491 952	178 172 903 K
2.2 - 3.0	220	4000	234 073 ****	305 491 953	178 172 904 K
3.0 - 4.0	220	6500	234 074 ****	305 491 957	178 173 921 K

4CT PM MOTOR - 3-PHASE - STATOR AND ROTOR | 1.1 - 7.5 KW | 380V

P _N [kW]	U _N [V]	Thrust F [N]	model no..	model no. stator	model no. rotor
1.1 - 2.2	380	4000	234 062 ****	305 491 954	178 172 903 K
2.2 - 3.0	380	4000	234 063 ****	305 491 955	178 172 904 K
3.0 - 4.0	380	6500	234 064 ****	305 491 958	178 173 921 K
7.5	380	6500	234 066 ****	305 491 959	178 141 921 K

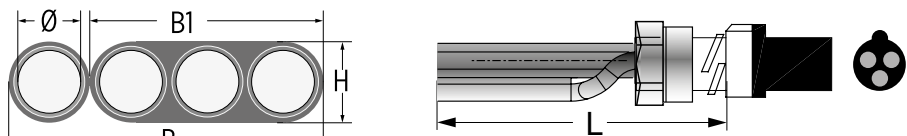
4" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

4CT PM MOTOR - 3-PHASE - CONNECTIONS



U = black (BK) | W = brown (BN) | V = grey (GY) | PE = yellow/green (YE/GN)

4CT PM MOTOR - 3-PHASE - MOTOR LEADS | 0.55 - 7.5 KW

0.55 - 7.5 kW			
Ø [mm²]	B [mm]	B1 [mm]	H [mm]
3 x 1.5 + 1G 1.5	16.8	10.7	5.0
			
length L [m]	model no.		
	304SS/ 316SS		
1.50	310 178 501		
2.50	310 113 502		
5	310 113 505		
10	310 113 510		
15	310 113 515		
20	310 113 520		

Cables are designed for submerged operation. For air operation, please consult Franklin Electric.



Tutorial 4CT cable installation



Tutorial 4" termination kit assembly

6" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR



FEATURES & BENEFITS

- The permanent magnet synchronous motor provides superior efficiency, excellent energy savings and strong reliability.
- Instead of a short-circuit induction type rotor, the high efficiency motor contains a permanent magnet rotor design with buried magnets and magnetic core segments.
- The permanent magnet motor design eliminates electrical rotor losses resulting in lower motor amps, improved partial load behavior and reduced temperature heat rise.
- The PM motor has a lower weight, a reduced length and requires lower Amps to run at the same pump load.
- For operation with Variable frequency drive (VFD)
- Double-flange NEMA mounting design
- Stainless steel splined shaft
- StatorShield™ - Franklin encapsulation system: Franklin Electric encapsulated motors are equipped with hermetically-sealed windings. The stator resin mechanically supports the winding and provides fast heat dissipation.
- Hydrodynamic liquid lubricated radial bearings and High capacity Kingsbury type thrust bearing for 100 % maintenance free operation
- Field replaceable lead using Franklin's exclusive Water Bloc technology
- Pressure-equalizing diaphragm, spring pre-loaded
- SandFighter™ sealing system with SIC mechanical seal and sand slinger
- Standard motor: WW- Water well design (stator: 304SS / castings: CI powder coated)
- Factory filled with FES Franklin's non-toxic water soluble fill solution
- Drinking water approvals

STANDARD SPECIFICATION

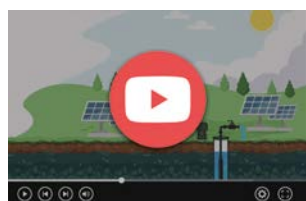
- Ratings: 4 - 45 kW (100 Hz - 3000 rpm)
- Thrust load: 15.5 kN: 4-22 kW; 27.5 kN: 26-45 kW
- Max. storage temperature: -15°C - +60°C
- Nominal ambient temperature: 30 °C
4-22 kW (with 0.16 m/s cooling flow)
> 22 kW (with 0.5 m/s cooling flow)
- System Supply Voltage: 380 V (100 Hz)
- Voltage tolerance U_N : ± 10 %
- protection IP68
- Insulation class F
- Protection requirements: DIN/EN 60947-4-1
- Frequency of starts: 20 starts/ hour (with min. 3 minutes resting time), equally distributed)
- DOL-start
- All motors with factory installed leads
- Installation orientation: Vertical / horizontal (shaft end heightened)
- Rotation counter clock wise facing shaft end (rotation reversible for 3 phase motors)

OPTIONS

- Higher-graded material: 304SS, 316SS
- Special voltages
- 45 kN High Thrust version
- Retrofittable PT 100 temperature sensor
- Special lead lengths
- 120 Hz electrical design
- High Efficiency system solution



Permanent magnet technology
in submersible motors



Cost savings of Franklin Electric
High Efficiency Systems



High Efficiency System



Variable Frequency drives
& Accessories