

# 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

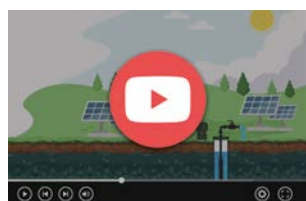
- Ratings: 4 - 45 kW (100 Hz - 3000 rpm)
- Thrust load: 15.5 kN: 4-22 kW; 27.5 kN: 26-45 kW
- Max. storage temperature: -15°C - +60°C
- Nominal ambient temperature: 30 °C  
4-22 kW (with 0.16 m/s cooling flow)  
> 22 kW (with 0.5 m/s cooling flow)
- System Supply Voltage: 380 V (100 Hz)
- Voltage tolerance  $U_N$ :  $\pm 10\%$
- 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



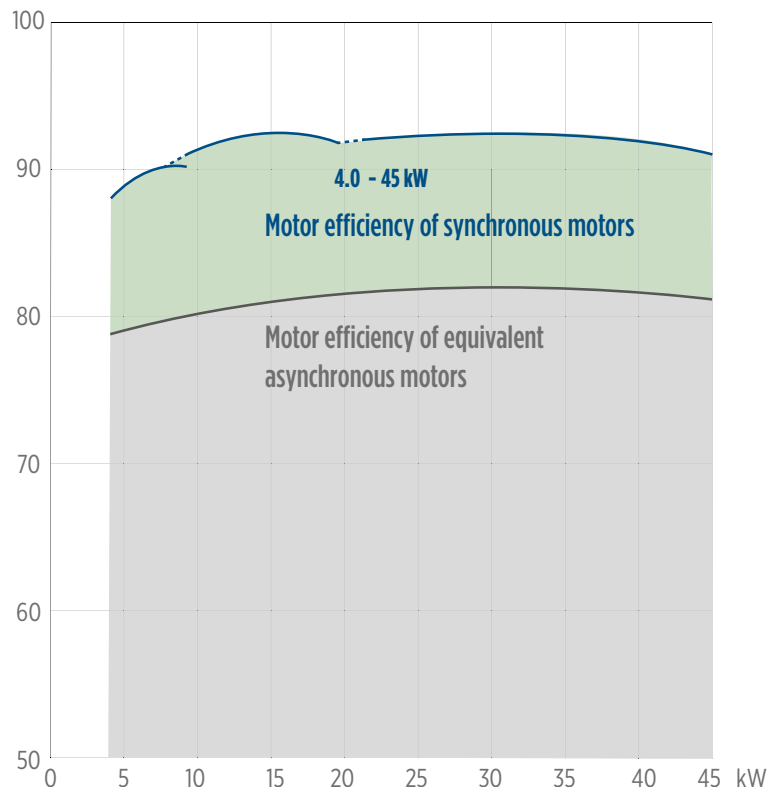
High Efficiency System



Variable Frequency drives  
& Accessories

# 6" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

efficiency [%]



**SAND FIGHTER**

STAINLESS STEEL  
**304**

STAINLESS STEEL  
**316**



HIGH EFFICIENCY

## 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.

## 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.

## 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.



# 6" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

6CT PM MOTOR - 3-PHASE - MOTOR MODEL NO. | DOL | 100 HZ | 380V

| P <sub>N</sub><br>[kW] | U <sub>N</sub><br>[V] | Thrust F<br>[N] | Digit 1 - 6 | Digit 7 - 10<br>Single pack with pre-installed lead |       |                |
|------------------------|-----------------------|-----------------|-------------|-----------------------------------------------------|-------|----------------|
|                        |                       |                 |             | WW                                                  | 304SS | Standard 316SS |
| 4 - 11                 | 380                   | 15500           | 236 080     | 9561                                                | 1461  | 1561           |
| 13 - 22                | 380                   | 15500           | 236 084     | 9561                                                | 1461  | 1561           |
| 26 - 45                | 380                   | 27500           | 236 086     | 9561                                                | 1461  | 1561           |

6CT PM MOTOR - 3-PHASE - MOTOR PERFORMANCE DATA | 4-45 KW | 100 HZ

| motor model no. | P <sub>N</sub><br>[kW] | Thrust F<br>[N] | U <sub>N</sub><br>[V] | n <sub>N</sub><br>[min <sup>-1</sup> ] | I <sub>N</sub><br>[A] | I <sub>A</sub> /I <sub>N</sub><br>[A] | η<br>[%] | cos phi | T <sub>N</sub><br>[Nm] | T <sub>A</sub> /T <sub>N</sub><br>[Nm] |
|-----------------|------------------------|-----------------|-----------------------|----------------------------------------|-----------------------|---------------------------------------|----------|---------|------------------------|----------------------------------------|
| 236 080 xxxx    | 4                      | 15500           | 380                   | 3000                                   | 9,2                   | 1                                     | 87,1     | 0,95    | 12,7                   | 1                                      |
|                 | 5.5                    |                 |                       |                                        | 11,0                  | 1                                     | 89,8     | 0,95    | 17,5                   | 1                                      |
|                 | 7.5                    |                 |                       |                                        | 14,1                  | 1                                     | 90,9     | 0,95    | 23,9                   | 1                                      |
| 236 080 xxxx    | 9.3                    | 15500           | 380                   | 3000                                   | 17,2                  | 1                                     | 91,2     | 0,95    | 29,6                   | 1                                      |
|                 | 11                     |                 |                       |                                        | 20,5                  | 1                                     | 90,9     | 0,95    | 35,0                   | 1                                      |
| 236 084 xxxx    | 13                     | 15500           | 380                   | 3000                                   | 25,3                  | 1                                     | 91,4     | 0,95    | 41,4                   | 1                                      |
|                 | 15                     |                 |                       |                                        | 28,3                  | 1                                     | 91,8     | 0,95    | 47,7                   | 1                                      |
| 236 084 xxxx    | 18.5                   | 15500           | 380                   | 3000                                   | 34,1                  | 1                                     | 92,1     | 0,95    | 58,9                   | 1                                      |
| 236 084 xxxx    | 22                     | 15500           | 380                   | 3000                                   | 40,7                  | 1                                     | 92       | 0,95    | 70                     | 1                                      |
| 236 086 xxxx    | 26                     | 27500           | 380                   | 3000                                   | 51,2                  | 1                                     | 92,3     | 0,95    | 82,8                   | 1                                      |
|                 | 30                     |                 |                       |                                        | 57,8                  | 1                                     | 92,5     | 0,95    | 95,5                   | 1                                      |
| 236 086 xxxx    | 37                     | 27500           | 380                   | 3000                                   | 71,3                  | 1                                     | 92,1     | 0,95    | 117,8                  | 1                                      |
| 236 086 xxxx    | 45                     | 27500           | 380                   | 3000                                   | 90,0                  | 1                                     | 90,8     | 0,95    | 143,2                  | 1                                      |

6CT PM MOTOR - 3-PHASE - MOTOR PART DESCRIPTION | WW | 304SS | 316SS

| part            | WW                      | 304SS     | 316SS     |
|-----------------|-------------------------|-----------|-----------|
| Shell           | 1.4301                  | 1.4301    | 1.4571    |
| Upper end bell  | Cast iron powder coated | 1.4301    | 1.4408    |
| Thrust housing  | Cast iron powder coated | 1.4301    | 1.4408    |
| Mechanical seal | SiC / SiC               | SiC / SiC | SiC / SiC |
| Seal cover      | 1.4301                  | 1.4301    | 1.4401    |
| Slinger         | EPDM                    | EPDM      | EPDM      |
| Shaft end*      | 14021                   | 14021     | 14462     |
| Diaphragm       | EPDM                    | EPDM      | EPDM      |
| Lead            | EPR                     | EPR       | EPR       |

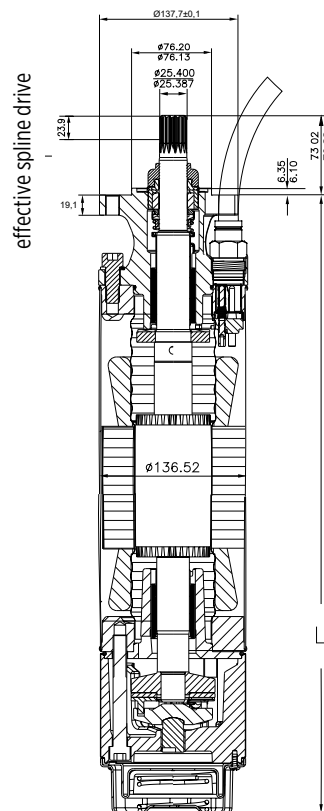
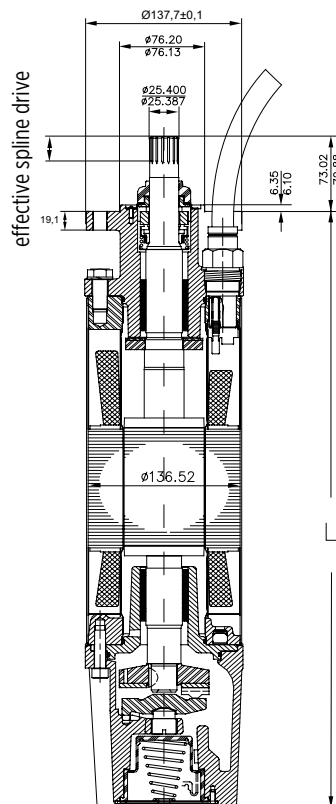
\* running change to 1.4462 (WIP)

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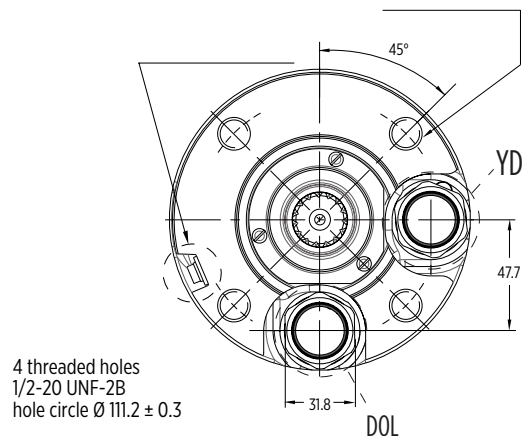
6CT PM MOTOR - 3-PHASE - DIMENSIONS AND WEIGHTS | WW | 304SS | 316SS

WW

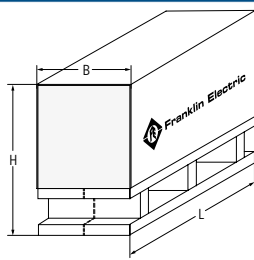
304SS | 316SS



upper end bell WW | 304SS | 316SS



Tolerances according to NEMA MG 1-18.388

| $P_N$<br>[kW] | $U_N$<br>[V] | Thrust F<br>[N] | length [mm] |               | weight<br>[kg] | motor with lead in single pack |             | motor packaging                                                                       |
|---------------|--------------|-----------------|-------------|---------------|----------------|--------------------------------|-------------|---------------------------------------------------------------------------------------|
|               |              |                 | WW          | 314SS   316SS |                | B x H x L [mm]                 | weight [kg] |                                                                                       |
| 4 - 11        | 380          | 15500           | 634.5       | 625.2         | 43             | 155 x 340 x 800                | 45          |  |
| 13 - 22       | 380          | 15500           | 793.5       | 784.2         | 57.4           | 155 x 340 x 1070               | 61          |                                                                                       |
| 26 - 45       | 380          | 27500           | 1020.5      | 1011.2        | 78.0           | 155 x 340 x 1070               | 84          |                                                                                       |

# 6" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

## 6CT PM MOTOR - 3-PHASE - MOTOR LEADS | CONNECTIONS

| 4G4 mm <sup>2</sup> | 3 x 8,4 + 1G 8,4 mm <sup>2</sup> | Electrical connection |
|---------------------|----------------------------------|-----------------------|
|                     |                                  |                       |

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

| Motor leads 4 - 22 kW  |        |        |         |              |             |             |             |
|------------------------|--------|--------|---------|--------------|-------------|-------------|-------------|
| Ø [mm <sup>2</sup> ]   | C [mm] | B [mm] | H [mm]  | length L [m] | WW          | 316SS       |             |
| 4G4                    | 32     | 19     | 7       | 4            | 310 125 004 | 310 125 504 |             |
|                        |        |        |         |              |             |             |             |
| Motor leads 26 - 45 kW |        |        |         |              |             |             |             |
| Ø [mm <sup>2</sup> ]   | C [mm] | B [mm] | B1 [mm] | B1 [mm]      | H [mm]      | WW          | 316SS       |
| 3x8,4 + 1G8,4          | 32     | 29.5   | 19.5    | 19.5         | 8.9         | 310 145 004 | 310 145 504 |
|                        |        |        |         |              |             |             |             |

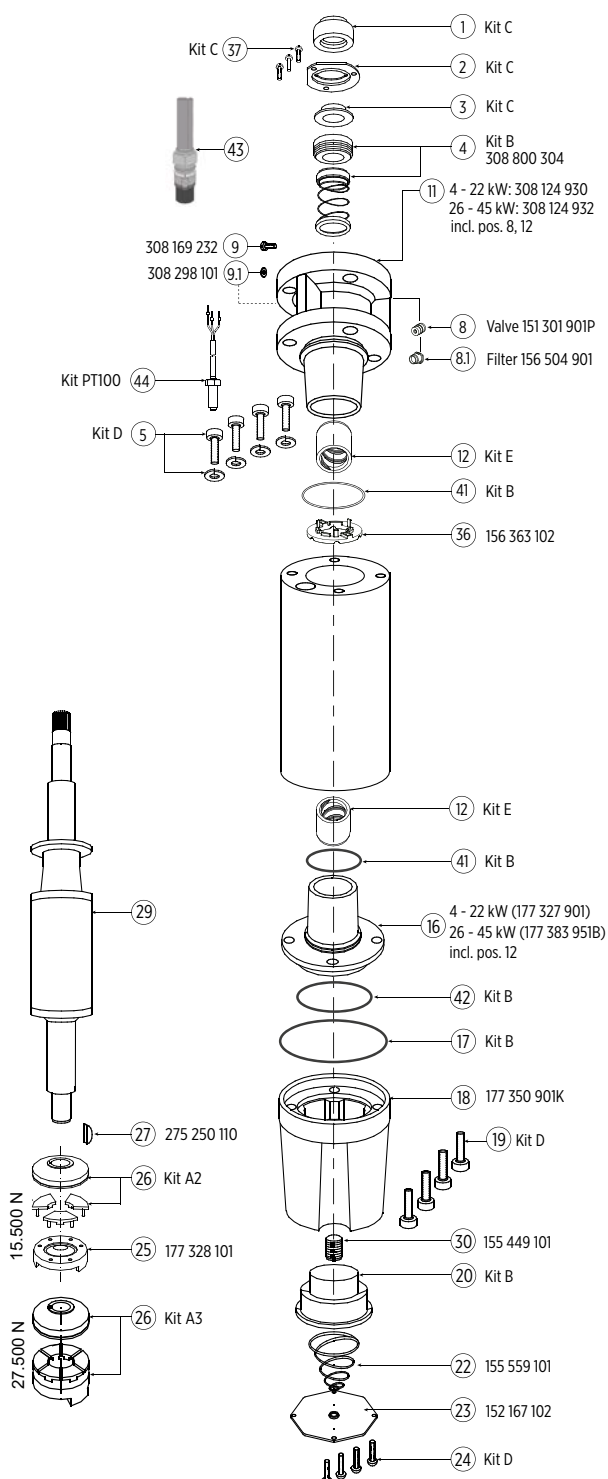
Cables are designed for submerged operation. For air operation, please consult Franklin Electric.

## 6CT PM MOTOR - 3-PHASE - WINDING RESISTANCE DATA | 380V | 100 HZ

| P <sub>N</sub> [kW] | U <sub>N</sub> [V] | stator reference no. | U - V [Ohm]* | rotor reference no. |
|---------------------|--------------------|----------------------|--------------|---------------------|
| 4 - 11              | 380                | 327 245 ...          | 0,86         | 178 130 921         |
| 13 - 22             | 380                | 327 250 ...          | 0,33         | 178 130 923         |
| 26 - 45             | 380                | 327 257 ...          | 0,19         | 178 130 925         |

# 6" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

## 6CT PM MOTOR - 3-PHASE - MOTOR SPARE PARTS - KITS | WW



| Kit       | description                                   | included positions | part no.    |
|-----------|-----------------------------------------------|--------------------|-------------|
| Kit A2    | thrust bearing kit<br>  15500N<br>up to 22 kW | 26                 | 308 750 120 |
| Kit A3    | Thrust bearing kit<br>  27500N<br>26 - 45 kW  | 26                 | 308 750 120 |
| Kit B1    | seal kit                                      | 4, 17, 20, 41, 42  | 308 800 125 |
| Kit C1    | slinger kit                                   | 1, 2, 3, 37        | 308 725 101 |
| Kit D1    | screw kit                                     | 5, 19, 24          | 308 659 121 |
| Kit E1*   | radial bearing kit<br>up to 22 kW             | 12                 | 308 678 103 |
| Kit E2    | radial bearing kit<br>26 - 45 kW              | 12                 | 308 678 110 |
| PT100 kit |                                               | 44                 | cf. section |

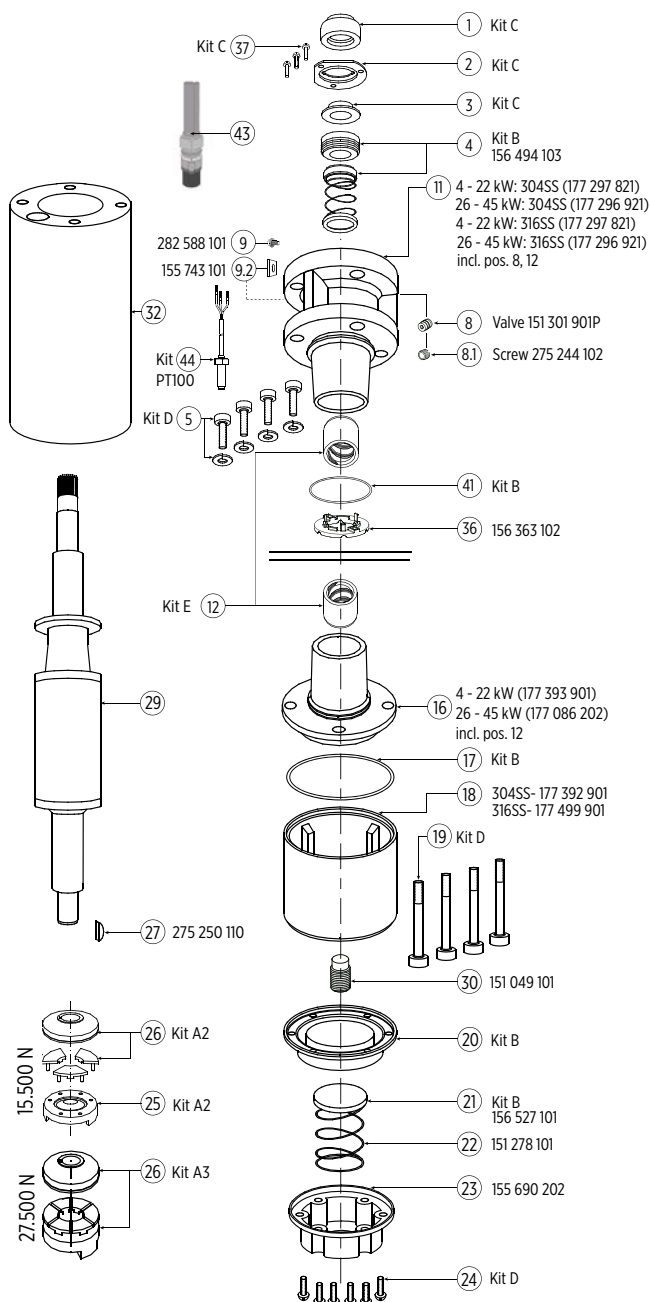
HIGH EFFICIENCY

## 6CT PM MOTOR - 3-PHASE - STATOR AND ROTOR | 4-45 KW | WW | 100 HZ

| P <sub>N</sub><br>[kW] | U <sub>N</sub><br>[V] | Thrust F<br>[N] | model no.<br>motor | model no.<br>rotor 304SS | model no.<br>rotor WW |
|------------------------|-----------------------|-----------------|--------------------|--------------------------|-----------------------|
| 4 - 11                 | 380                   | 15500           | 236 080 9561       | 327 245 963K             | 178 130 901K          |
| 13 - 22                | 380                   | 15500           | 236 084 9561       | 327 250 963K             | 178 130 903K          |
| 26 - 45                | 380                   | 27500           | 236 086 9561       | 327 257 963K             | 178 130 905K          |

# 6" ENCAPSULATED PERMANENT MAGNET (PM) MOTOR

6CT PM MOTOR - 3-PHASE - MOTOR SPARE PARTS - KITS | 304SS | 316SS



| Kit       | description                             | included positions    | part no.    |
|-----------|-----------------------------------------|-----------------------|-------------|
| Kit A2    | Thrust bearing kit   15500N up to 22 kW | 26                    | 308 750 120 |
| Kit A3    | Thrust bearing kit   27500N 26 - 45 kW  | 26                    | 308 750 200 |
| Kit B3    | seal kit                                | 4, 17, 20, 21, 41, 44 | 308 800 250 |
| Kit C3    | slinger kit                             | 1, 2, 3, 37           | 308 725 150 |
| Kit D5    | screw kit                               | 5, 19, 24             | 308 659 155 |
| Kit E1*   | Radial bearing kit up to 22 kW          | 12                    | 308 678 103 |
| Kit E2    | Radial bearing kit 26 - 45 kW           | 12                    | 308 678 110 |
| PT100 Kit | 0                                       | 44                    | cf. section |

\* kit without rotor shaft sleeves, flange replacement bushings are unfinished

6CT PM MOTOR - 3-PHASE - STATOR AND ROTOR | 4-45 KW | 304SS | 316SS | 100 HZ

| P <sub>N</sub><br>[kW] | U <sub>N</sub><br>[V] | Thrust F<br>[N] | motor model no. |              | model no.<br>rotor | model no.<br>rotor |
|------------------------|-----------------------|-----------------|-----------------|--------------|--------------------|--------------------|
|                        |                       |                 | 304SS           | 316SS        |                    |                    |
| 4 - 11                 | 380                   | 15500           | 236 080 1461    | 236 080 1561 | 327 245 983K       | 178 130 921K       |
| 13 - 22                | 380                   | 15500           | 236 084 1461    | 236 084 1561 | 327 250 983K       | 178 130 923K       |
| 26 - 45                | 380                   | 27500           | 236 086 1461    | 236 086 1561 | 327 257 983K       | 178 130 925K       |