maranello alternator

# M110

CONT 100 kVA

# THREE-PHASE SYNCHRONOUS GENERATOR

Datasheet for 4 poles -50Hz @ 1500rpm/ 60Hz @ 1800rpm

| | | | |
|---|---|---|---|
| Ambient Temperature | 40°C | Method of Cooling | Air cooling |
| Temperature Rise | 125°C | Direction of Rotation | Clockwise |
| Insulation Class | H | Maximum Over-speed | 2250r/min |
| Power Factor | 0.8 | Degree of Protection / Enclosure | IP23 |
| Excitation | Brushless | Altitude | 1000m |
| Winding Pitch | 2/3 | Stator winding | DLL |
| Pole | 4 | Number of Terminal | 12 |
| Duty | S1- Continuous | Rotor | With damping cage |
| Waveform | TIF<50 | THF<2% | |
| Waveform distortion | BS EN 61000-6-2&BS EN 61000-6-4,VDE 0875G,VDE0874N | | |
| Radio interference | Noload<1.5%,Non-distorting balanced linear load<5% | | |

| AVR MODEL AVR | Standard | Selection | | PMG | | |
|---|---|---|---|---|---|---|
| | SX460 | AS440 | KRS440 | MX341B | MX321 | |
| Voltage Regulation - in steady state condition | ±1.0 | ±1.0 | ±1.0 | ±0.5 | ±0.5 | |
| Short Circuit Current Capacity | Control does not sustain a short circuit current | | | 430A | | |

## Electrical Characteristic

| Frequency | Hz | 50 | | | | 60 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Voltage ( series star ) Y | V | 380/220 | 400/231 | 415/240 | 440/254 | 416/240 | 440/254 | 460/266 | 480/277 |
| Voltage ( parallel star ) YY | V | 190/110 | 200/115 | 208/120 | 220/127 | 208/120 | 220/127 | 230/133 | 240/138 |
| Voltage ( series delta ) Δ | V | 220 | 230 | 240 | 254 | 240 | 254 | 266 | 277 |
| Rated power at Class H (125° C) temperature rise | kVA | 100 | 100 | 100 | N/A | 112.5 | 117.5 | 117.5 | 125 |
| | kW | 80.0 | 80.0 | 80.0 | N/A | 90.0 | 94.0 | 94.0 | 100.0 |
| Efficiency at Class H (P.F.=0.8) | 4/4% | 89.9 | 90.2 | 90.8 | N/A | 90.1 | 90.6 | 91 | 91 |
| | 3/4% | 91 | 91.4 | 91.7 | N/A | 91.5 | 91.7 | 92 | 92 |
| | 2/4% | 92.1 | 92.1 | 92.1 | N/A | 92.2 | 92.4 | 92.5 | 92.7 |
| Efficiency at Class H (P.F.=1.0) | 4/4% | 92 | 92.3 | 92.8 | N/A | 92.1 | 92.5 | 92.9 | 93 |
| | 3/4% | 93 | 93.3 | 93.5 | N/A | 93.2 | 93.5 | 93.7 | 93.8 |
| | 2/4% | 93.9 | 94 | 94 | N/A | 94 | 94.1 | 94.1 | 94.1 |
| Reactances (%) at Class H | | | | | | | | | |
| Direct axis synchronous reactance unsaturated | Xd | 2.45 | 2.21 | 2.05 | N/A | 2.76 | 2.58 | 2.36 | 2.3 |
| Direct axis transient reactance saturated | X'd | 0.2 | 0.18 | 0.17 | N/A | 0.24 | 0.22 | 0.21 | 0.2 |
| Direct axis subtransient reactance saturated | X"d | 0.14 | 0.13 | 0.12 | N/A | 0.16 | 0.15 | 0.14 | 0.13 |
| Quadrature axis synchronous reactance unsaturated | Xq | 1.59 | 1.43 | 1.33 | N/A | 1.58 | 1.48 | 1.35 | 1.32 |
| Quadrature axis subtransient reactance saturated | X"q | 0.18 | 0.16 | 0.15 | N/A | 0.23 | 0.21 | 0.2 | 0.19 |
| Leakage reactance | X1 | 0.07 | 0.06 | 0.06 | N/A | 0.08 | 0.07 | 0.07 | 0.07 |
| Negative sequence reactance saturated | X2 | 0.16 | 0.14 | 0.13 | N/A | 0.19 | 0.18 | 0.16 | 0.16 |
| Zero sequence reactance unsaturated | X0 | 0.1 | 0.09 | 0.08 | N/A | 0.12 | 0.11 | 0.1 | 0.1 |
| Short-circuit ratio | Kcc | 0.4082 | 0.4525 | 0.4878 | N/A | 0.3623 | 0.3876 | 0.4237 | 0.4348 |
| | | | | | | | | | |
| Short-circuit transient time constant (sec.) | T'd | 0.028 | | | | | | | |
| Subtransient time constant (sec.) | T"d | 0.001 | | | | | | | |
| Open circuit time constant (sec.) | T'do | 0.8 | | | | | | | |
| Armature time constant (sec.) | Tα | 0.007 | | | | | | | |
| Stator Winding Resistance (20℃) | ohm | 0.061 | | | | | | | |
| Rotor Winding Resistance (20℃) | ohm | 1.14 | | | | | | | |
| Exciter Stator Resistance (20℃) | ohm | 20 | | | | | | | |
| Exciter Rotor Phase resistance | ohm | 0.078 | | | | | | | |
| No load excitation current | io (A) | 0.5 | 0.52 | 0.6 | 0.5 | 0.5 | 0.51 | 0.52 | 0.53 |
| Full load excitation current | ic(A) | 1.8 | 1.8 | 1.9 | 1.8 | 1.8 | 1.8 | 1.9 | 1.9 |
| Cooling air requirement | $m^3$/sec | 0.514m3/s 1090cfm | | | | 0.617m3/s 1308cfm | | | |

## Mechanical Characteristic

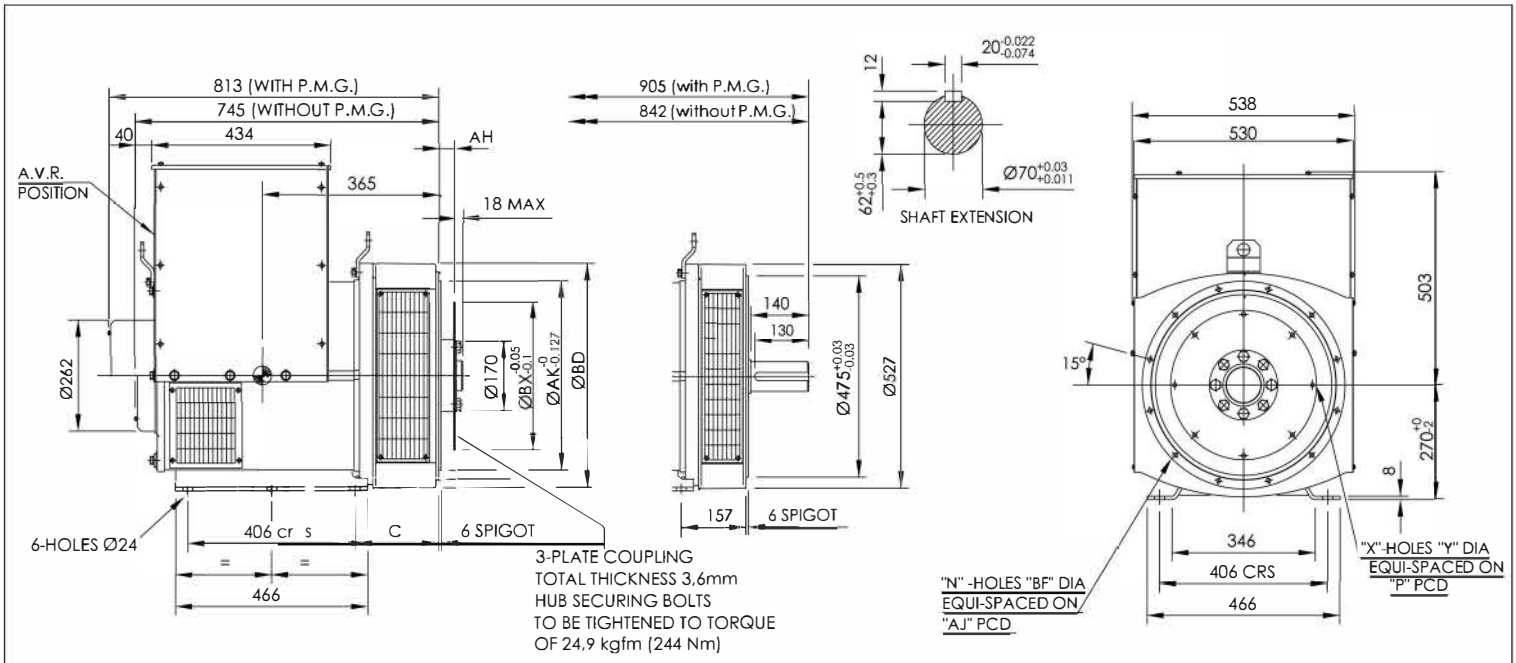
| | | |
|---|---|---|
| Configuration | Single Bearing | Double Bearing |
| Type of Construction | B2-SAE | IM B34 |
| Total Weight - kgs | 371 | 367 |
| Weight wound stator - kgs | 125 | 125 |
| Weight wound rotor - kgs | 133.78 | 122.82 |
| Inertia (J) [kgm2] | 1.0288kgm2 | 0.9781kgm2 |
| Drive end bearing / Lubrication | | BALL.6315-2RS(ISO) |
| Non-drive end bearing / Lubrication | BALL.6310-2RS(ISO) | BALL.6310-2RS(ISO) |
| Packing crate size（cm） | 88X63X94 | 92X63X94 |

## Winding 311 / 0.8 Power Factor

### RATINGS

| | Class - Temp Rise | Cont. F - 105/40°C | | | | Cont. H - 125/40°C | | | | Standby - 150/40°C | | | | Standby - 163/27°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **50 Hz** | Series Star (V) | 380 | 400 | 415 | 440 | 380 | 400 | 415 | 440 | 380 | 400 | 415 | 440 | 380 | 400 | 415 | 440 |
| | Parallel Star (V) | 190 | 200 | 208 | 220 | 190 | 200 | 208 | 220 | 190 | 200 | 208 | 220 | 190 | 200 | 208 | 220 |
| | Series Delta (V) | 220 | 230 | 240 | 254 | 220 | 230 | 240 | 254 | 220 | 230 | 240 | 254 | 220 | 230 | 240 | 254 |
| | kVA | 84.0 | 84.0 | 84.0 | N/A | 100.0 | 100.0 | 100.0 | N/A | 106.0 | 106.0 | 106.0 | N/A | 110.0 | 110.0 | 110.0 | N/A |
| | kW | 67.2 | 67.2 | 67.2 | N/A | 80.0 | 80.0 | 80.0 | N/A | 84.8 | 84.8 | 84.8 | N/A | 88.0 | 88.0 | 88.0 | N/A |
| | Efficiency (%) | 90.7 | 91.1 | 91.3 | N/A | 89.8 | 90.3 | 90.6 | N/A | 89.5 | 90.0 | 90.4 | N/A | 89.2 | 89.8 | 90.2 | N/A |
| | kW Input | 74.1 | 73.8 | 73.6 | N/A | 89.1 | 88.6 | 88.3 | N/A | 94.7 | 94.2 | 93.8 | N/A | 98.7 | 98.0 | 97.6 | N/A |
| **60 Hz** | Series Star (V) | 416 | 440 | 460 | 480 | 416 | 440 | 460 | 480 | 416 | 440 | 460 | 480 | 416 | 440 | 460 | 480 |
| | Parallel Star (V) | 208 | 220 | 230 | 240 | 208 | 220 | 230 | 240 | 208 | 220 | 230 | 240 | 208 | 220 | 230 | 240 |
| | Series Delta (V) | 240 | 254 | 266 | 277 | 240 | 254 | 266 | 277 | 240 | 254 | 266 | 277 | 240 | 254 | 266 | 277 |
| | kVA | 97.5 | 106.3 | 106.3 | 112.5 | 112.5 | 117.5 | 117.5 | 125.0 | 116.3 | 125.0 | 125.0 | 132.5 | 120.0 | 127.5 | 127.5 | 137.5 |
| | kW | 78.0 | 85.0 | 85.0 | 90.0 | 90.0 | 94.0 | 94.0 | 100.0 | 93.0 | 100.0 | 100.0 | 106.0 | 96.0 | 102.0 | 102.0 | 110.0 |
| | Efficiency (%) | 90.9 | 91.0 | 91.4 | 91.5 | 90.2 | 90.6 | 91.0 | 91.1 | 90.0 | 90.2 | 90.7 | 90.8 | 89.8 | 90.1 | 90.6 | 90.6 |
| | kW Input | 85.8 | 93.5 | 93.0 | 98.4 | 99.8 | 103.8 | 103.3 | 109.8 | 103.4 | 110.9 | 110.3 | 116.7 | 106.9 | 113.2 | 112.6 | 121.4 |

### DIMENSIONS




| COUPLING DISC | | | | | |
|---|---|---|---|---|---|
| SAE | BX | P | X | Y | AH |
| 14 | 466.72 | 438.15 | 8 | 13.5 | 25.4 |
| 11.5 | 352.42 | 333.38 | 8 | 11 | 39.6 |
| 10 | 314.32 | 295.28 | 8 | 11 | 53.8 |

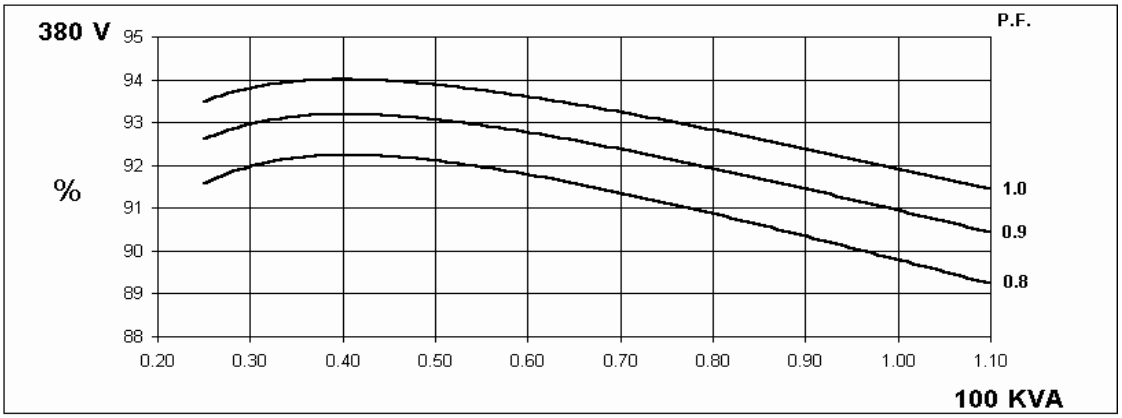
| FLANGE (mm) | | | | | | |
|---|---|---|---|---|---|---|
| SAE号 | BD | AK | AJ | BF | n | C |
| SAE3 | 451 | 409.58 | 428.62 | 11 | 12 | 202 |
| SAE2 | 490 | 447.68 | 466.72 | 11 | 12 | 202 |
| SAE1 | 553 | 511.17 | 530.22 | 12.7 | 12 | 216.3 |

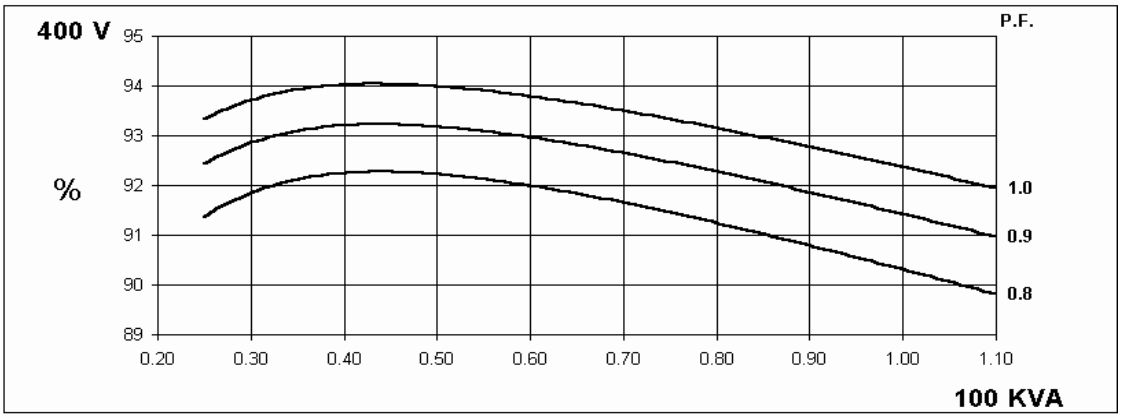
| | | | | | |
|---|---|---|---|---|---|
| | | | | SAE: | 1:1 |
| | | | | | A2 |
| VER | MOD | DRW | Date | | |
| Design | | APP | | | mm |
| CHK | | Date | 2018.01 | | |

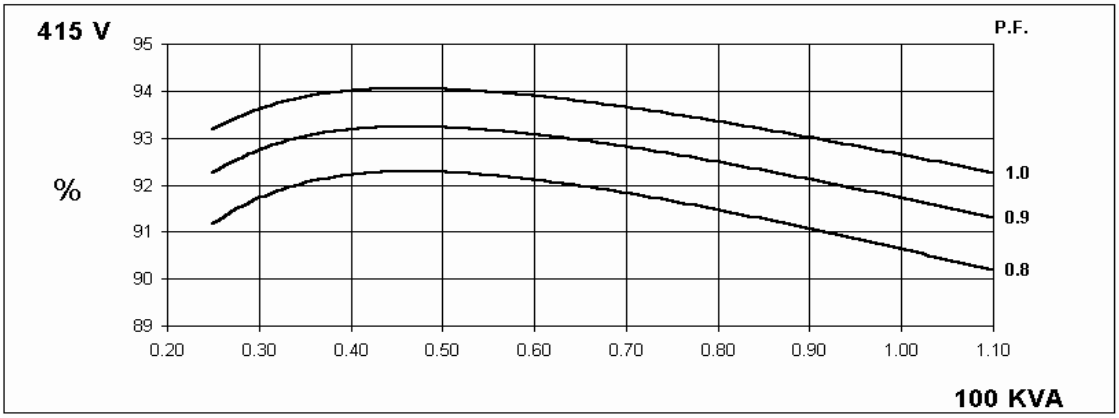
50 Hz

## Winding 311

## THREE PHASE EFFICIENCY CURVES



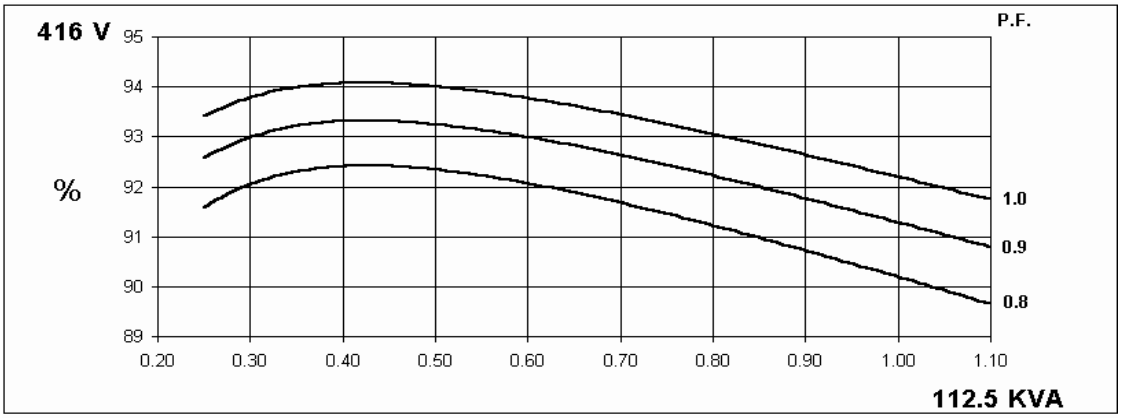



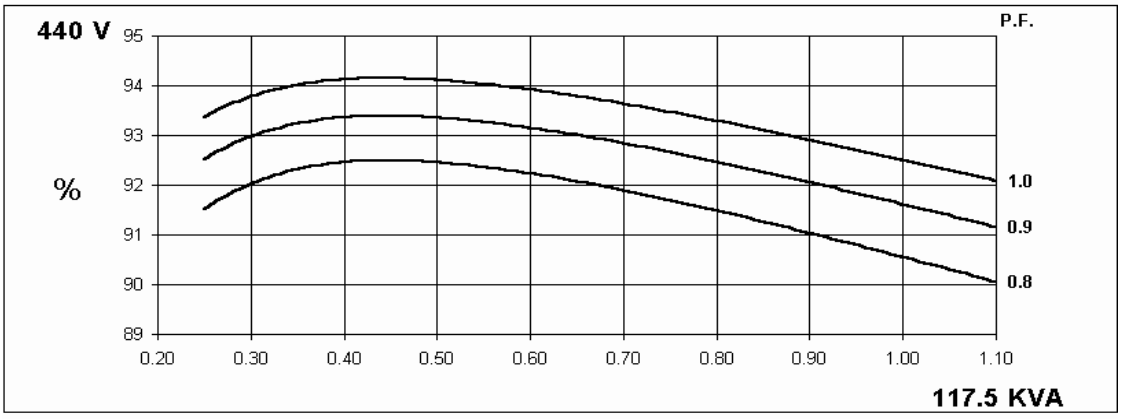



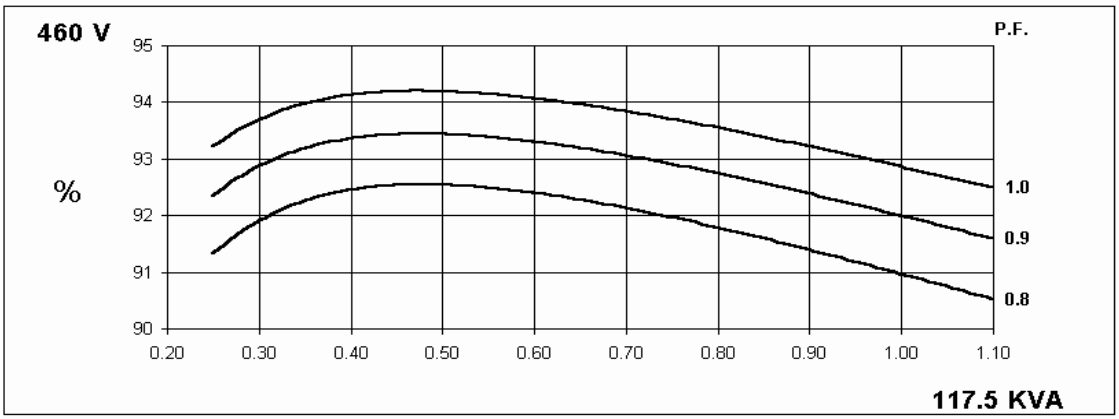
60 Hz

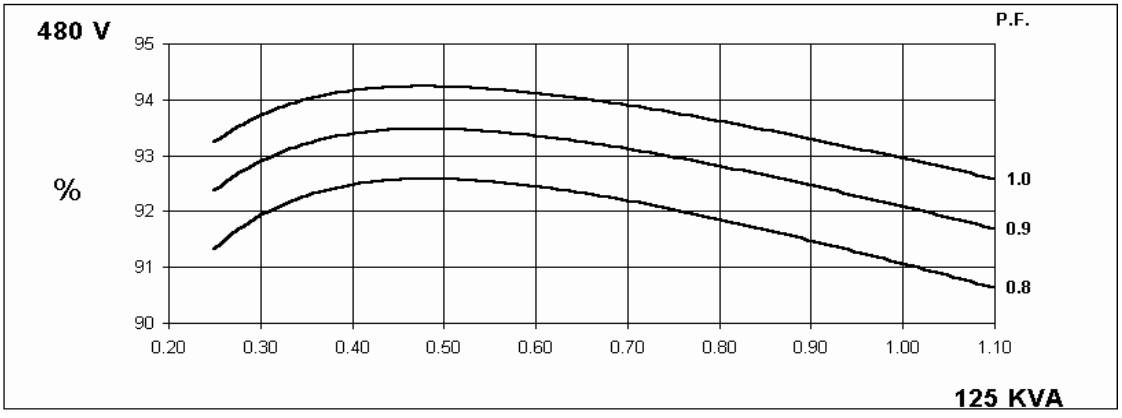
## Winding 311

## THREE PHASE EFFICIENCY CURVES



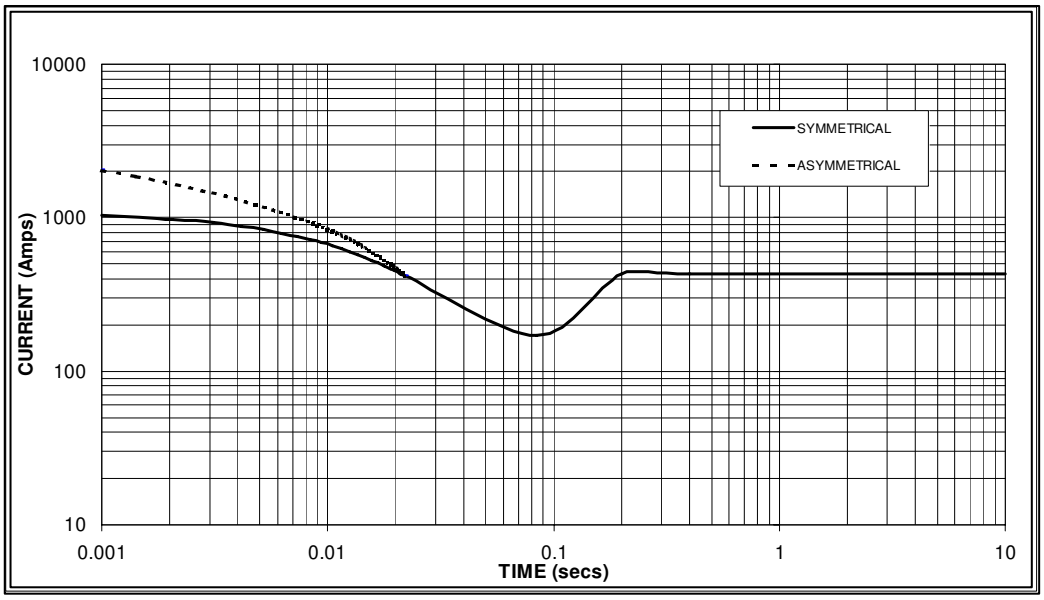



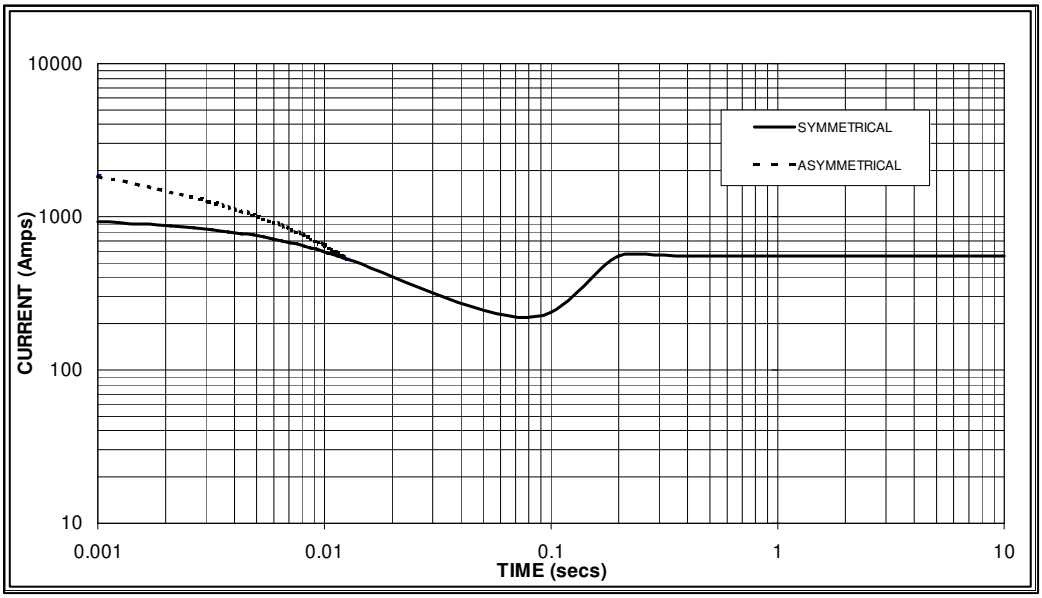
## Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed
## Based on star (wye) connection.

50 Hz




Sustained Short Circuit = 430 Amps

60 Hz




Sustained Short Circuit = 550 Amps

**Note 1**

The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

| 50Hz | | 60Hz | |
|---|---|---|---|
| Voltage | Factor | Voltage | Factor |
| 380v | X 1.00 | 416v | X 1.00 |
| 400v | X 1.07 | 440v | X 1.06 |
| 415v | X 1.12 | 460v | X 1.12 |
| | | 480v | X 1.17 |

The sustained current value is constant irrespective of voltage level

**Note 2**

The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

| | 3-phase | 2-phase L-L | 1-phase L-N |
|---|---|---|---|
| Instantaneous | x 1.00 | x 0.87 | x 1.30 |
| Minimum | x 1.00 | x 1.80 | x 3.20 |
| Sustained | x 1.00 | x 1.50 | x 2.50 |
| Max. sustained duration | 10 sec. | 5 sec. | 2 sec. |

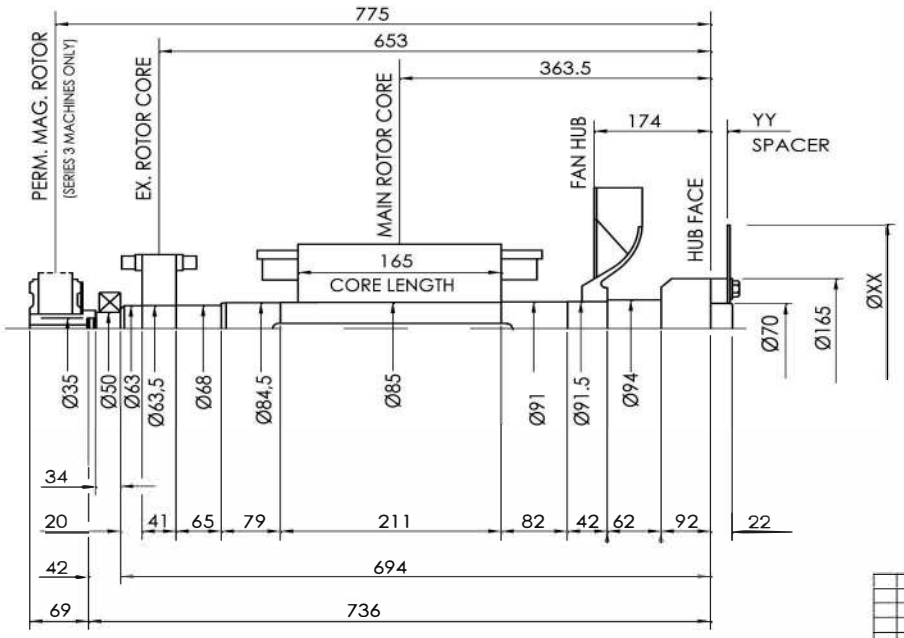
All other times are unchanged

**Note 3**

Curves are drawn for Star (Wye) connected machines. For other connection the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

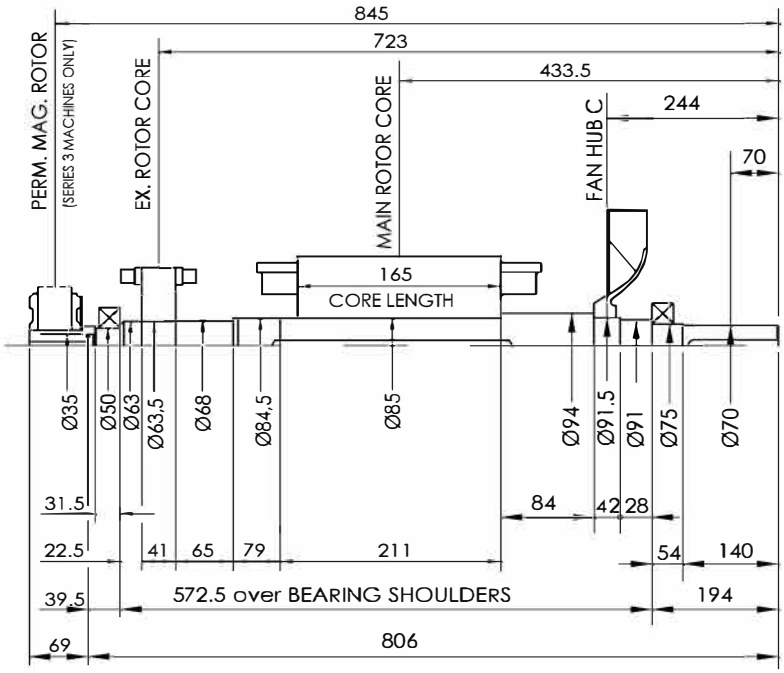
Series Delta = Curve current value X 1.732




| COMPONENT | Wt kg | J kgm$^2$ |
|---|---|---|
| EX. ROTOR | 8,490 | 0,0508 |
| MAIN ROTOR | 74.570 | 0,8155 |
| FAN | 3.389 | 0,0709 |
| SHAFT | 31.005 | 0,0275 |
| HUB | 10.878 | 0,0491 |
| TOTAL | 128.332 | 1.0138 |
| PERM. MAG. | 5,450 | 0,0150 |
| TOTAL | 133.782 | 1.0288 |

| COUPLING SAE No | COUPLING DIMEN's XX | COUPLING DIMEN's YY | COUPLING ASSEMBLY WEIGHT kg | COUPLING DISC J kgm$^2$ |
|---|---|---|---|---|
| * 10 | 314 | 14,3 | 5.55 | 0,0266 |
| * 11½ | 352 | - | 2.64 | 0,0423 |
| ! 11½ | 352 | 14,3 | 4,95 | 0,0423 |
| ! 14 | 467 | - | 4.74 | 0,1317 |

| | | | | |
|---|---|---|---|---|
| | | | | 1:1 |
| VER | MOD | DRW | Date | |
| Design | | APP | | |
| CHK | | Date | 2018.01 | mm |




| COMPONENT | Wt kg | J kgm$^2$ |
|---|---|---|
| EX. ROTOR | 8.49 | 0,0508 |
| MAIN ROTOR | 74.57 | 0.8155 |
| FAN | 3.389 | 0,0709 |
| SHAFT | 30.921 | 0,0259 |
| TOTAL | 117.37 | 0,9631 |
| PERM. MAG. | 5,450 | 0,0150 |
| TOTAL | 122.82 | 0,9781 |

| | | | | |
|---|---|---|---|---|
| | | | | 1:1 |
| VER | MOD | DRW | Date | |
| Design | | APP | | |
| CHK | | Date | 2018.01 | mm |




Şerifali, Tavukçuyolu Cd No:200, 34775 Ümraniye/İstanbul
+90 216 312 79 79
www.maranellogenerators.com
info@maranellogenerators.com