



**M15**

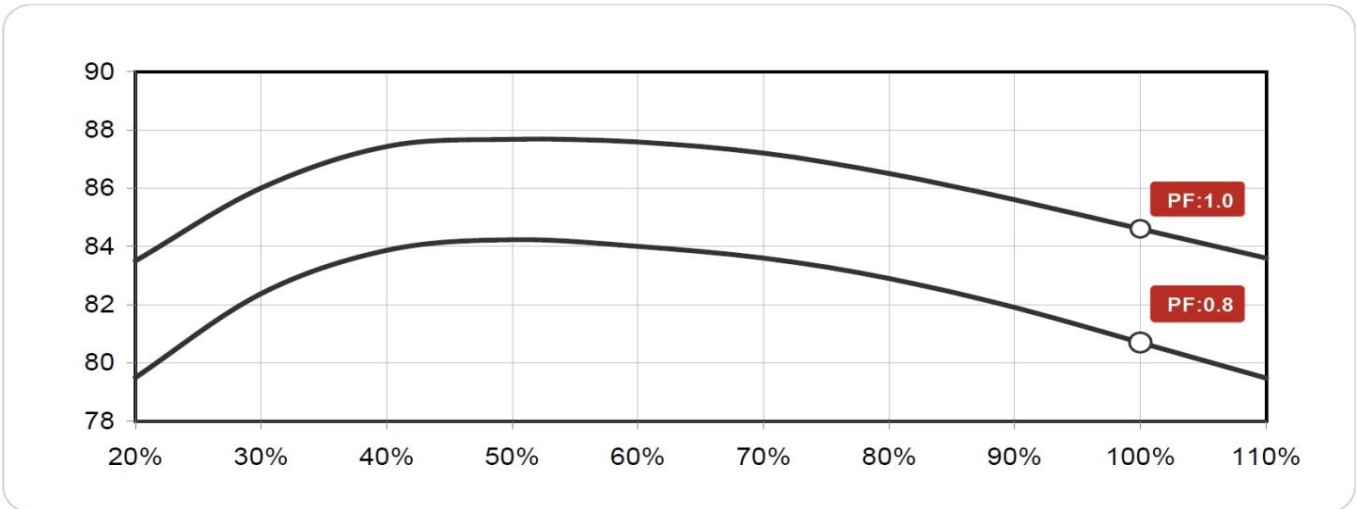
CONT 13,5 kVA



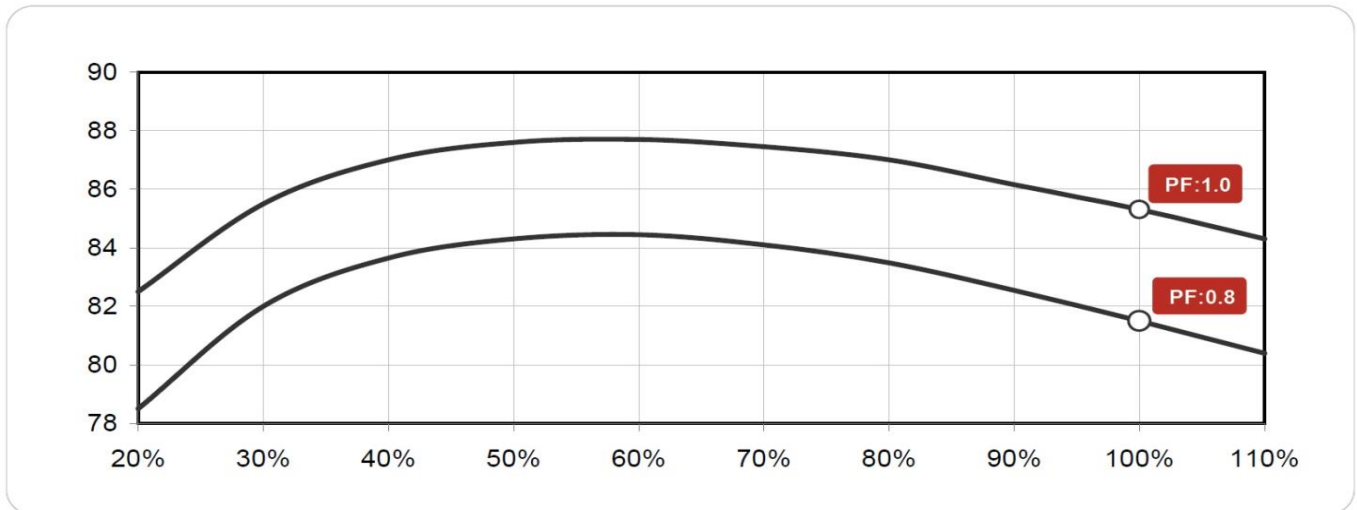


# Efficiency and Motor Starting

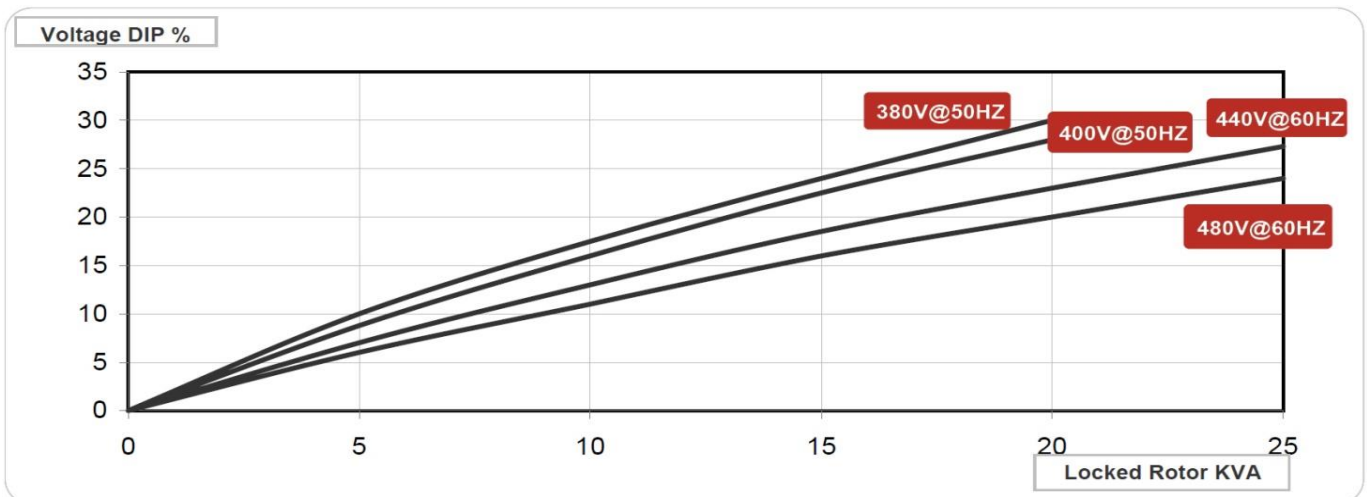
### Efficiency Curve @ 50 Hz, 400V



### Efficiency Curves @ 60 Hz, 480V



### Motor Starting Curves @ 50 Hz, 60 Hz Locked Rotor



## Technical Data Sheet

|                      | STANDARD(S)    | OPTIONAL(O) | INFORMATION (I) | SPECIFICATION  |
|----------------------|----------------|-------------|-----------------|--|
| EXCITATION SYSTEM    | SELF-EXCITED   | <b>S</b>    |                 | SUSTAINED SHORT-CIRCUIT: NOT AVAILABLE                       |
|                      | ARAP           |             |                 |  |
|                      | PMG            |             |                 |  |
| AVR                  | SX460          | <b>S</b>    |                 | REGULATION PRECISION : +/-1,0 %                              |
|                      | SX440          | <b>O</b>    |                 | REGULATION PRECISION : +/-1,0 %                              |
|                      | MX341          |             |                 |  |
|                      | MX321          |             |                 |  |
| WINDING INSULATION   | H              | <b>S</b>    |                 |  |
|                      | F              |             |                 |  |
| WINDING PITCH        | 2/3            | <b>S</b>    |                 | HIGHER FLEXIBILITY IN USE,BETTER MOTOR STARTING ABILITY      |
|                      | 5/6            | <b>O</b>    |                 | COST-EFFECTIVE POWER SUPPLY SCHEME                           |
| WINDING PROTECTION   | STANDARD       | <b>S</b>    |                 |  |
|                      | "ANTI-HARSH"   | <b>O</b>    |                 | SPECIAL TREATMENT OF WINDING TO AGINST HASRH ENVIROMENT      |
|                      | SPACE HEATER   | <b>O</b>    |                 | TO HEAT UP AIR TO REMOVE THE HUMMINITY AROUND WINDING        |
|                      | THERMAL SENSOR | <b>O</b>    |                 | TO DETECT THE WINDING TEMPERATURE OR BEARING'S               |
| PARALLEL OPERATION   | CT100          | <b>O</b>    |                 |  |
|                      | CT200          |             |                 |  |
|                      | CT400          |             |                 |  |
|                      | CT600          |             |                 |  |
|                      | CT1000         |             |                 |  |
| WINDING LEADS        | 12             | <b>S</b>    |                 | 12 LEADS OF WINDING ENDS,                                    |
|                      | 6              | <b>O</b>    |                 | 6 LEADS OF WINDING ENGS                                      |
| MACHINE PROCTIION    | IP23           | <b>S</b>    |                 | STANDARD MACHINE PROTECTION                                  |
|                      | IP44           | <b>O</b>    |                 | TO AGINST : 1mm OBJECT AND SPLASHING WATER                   |
|                      | IP54           |             |                 |  |
| POWER FACTOR         | 1              | <b>O</b>    |                 |  |
|                      | 0,8            | <b>S</b>    |                 |  |
| CONNECTION TO ENGINE | SINGLE BEARING | <b>S</b>    |                 |  |
|                      | DOUBLE BEARING | <b>O</b>    |                 |  |
|                      | BELT DRIVE     | <b>O</b>    |                 |  |
|                      | VERTICAL       |             |                 |  |
| OVERSPEED            |                |             | <b>I</b>        | MAX ROTATING SPEED : 2250 RPM                                |
| ATTITUDE             | <=1000m        |             | <b>I</b>        | DERATING IS NO NEED  |
|                      | >1000m         |             | <b>I</b>        | DERATING NEEDED, REFERS TO RATING BOOK                       |
| ELECTIRICAL FEATRUES | TDF/THC        |             | <b>I</b>        | NO LOAD < 1,5 %, NON DISTORATING BALANCED LINEAR LOAD< 5,0 % |
|                      | TIF            |             | <b>I</b>        | <50  |
|                      | THF            |             | <b>I</b>        | <2%  |
| BEARING              | DRIVE -END     |             | <b>I</b>        | BALL 6309 - 2RS DOUBLE BEARING : 83 KG                       |
|                      | NON DRIVE END  |             | <b>I</b>        | BALL 6309 - 2RS  |
| WEIGHT               | NET            |             | <b>I</b>        | SINGLE BEARING 98 KG DOUBLE BEARING : 101 KG                 |
|                      | GROSS          |             | <b>I</b>        | SINGLE BEARING 126 KG DOUBLE BEARING : 129 KG                |
| PACKING SIZE         |                |             | <b>I</b>        | SINGLE B. : 1120 x680x700 mm DOUBLE B. : 1120X680X700        |

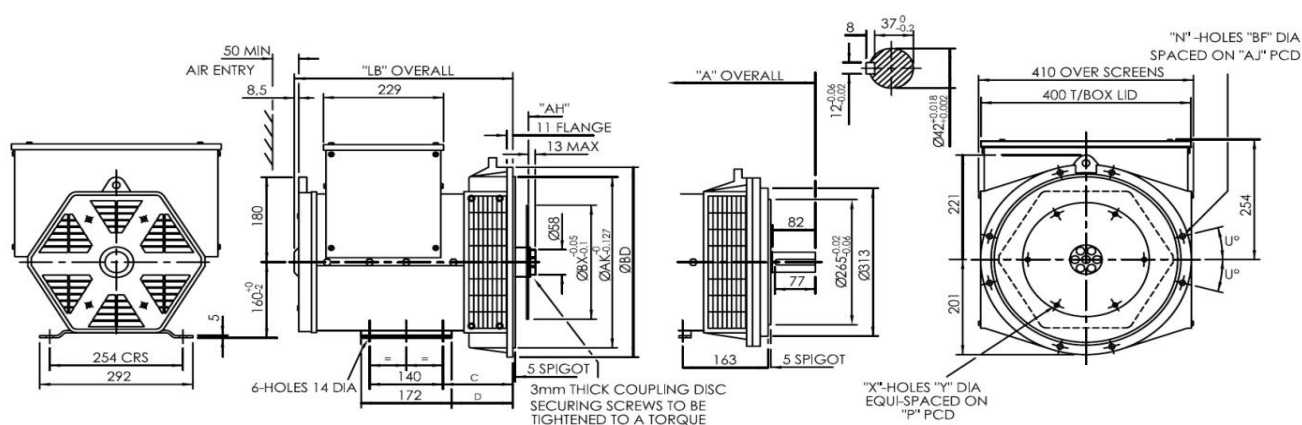
## Technical Data Sheet

### STANDARD(S) OPTIONAL(O) INFORMATION (I)

### SPECIFICATION

|  |        |       |       |       |       |       |       |       |
|--|--------|-------|-------|-------|-------|-------|-------|-------|
| SERIES STAR (V)  | 380    | 400   | 415   | 440   | 416   | 440   | 460   | 480   |
| PARALLEL STAR (V)                                      | 190    | 200   | 208   | 220   | 208   | 220   | 230   | 240   |
| SERIES DELTA (V)                                       | 220    | 230   | 240   | 254   | 240   | 254   | 266   | 277   |
| Xd - Direct axis synchro. Reactance unsaturated        | 1,943  | 1,754 | 1,629 | 1,780 | 2,303 | 2,174 | 1,989 | 1,827 |
| X'd - Direct axis transient reactance saturated.       | 0,198  | 0,179 | 0,166 | 0,182 | 0,236 | 0,223 | 0,204 | 0,187 |
| X''d - Direct axis sub transient reactance saturated   | 0,124  | 0,112 | 0,104 | 0,114 | 0,147 | 0,139 | 0,127 | 0,117 |
| Xq - Qadro. Axis synchro.reactance unsaturated.        | 0,966  | 0,872 | 0,810 | 0,885 | 1,144 | 1,081 | 0,989 | 0,908 |
| X''q - Quadro. Axis sub transient reactance saturated. | 0,223  | 0,201 | 0,187 | 0,204 | 0,263 | 0,249 | 0,228 | 0,209 |
| X2 - Negative sequence reactance unstrated             | 0,186  | 0,168 | 0,156 | 0,171 | 0,221 | 0,208 | 0,191 | 0,175 |
| Xo -Zero sequence reactance unsaturated.               | 0,084  | 0,076 | 0,071 | 0,077 | 0,100 | 0,094 | 0,086 | 0,079 |
| T'd- Short - Circuit transient time constant           | 0,016s |       |       |       |       |       |       |       |
| T''d - Sub Transient time constant                     | 0,004s |       |       |       |       |       |       |       |
| T'do- Open circuit time constant                       | 0,3s   |       |       |       |       |       |       |       |
| Ta- Armature time constant                             | 0,005s |       |       |       |       |       |       |       |
| Kcc - Short Circuit Ratio                              | 1/Xd   |       |       |       |       |       |       |       |

## Outline Drawing



| DIMENSIONS (mm) |         |       | 2-BRG |
|-----------------|---------|-------|-------|
| SAE             | TYPE    | LB    | A     |
| SAE 3           | SMF160D | 403.5 | 511.5 |
| SAE 4/5         | SMF160D | 391.5 |       |

|      | FLANGE(mm) |        |        |      |    |    |     |     |
|------|------------|--------|--------|------|----|----|-----|-----|
|      | BD         | AK     | AJ     | U°   | BF | N  | C   | D   |
| SAE5 | 356        | 314.32 | 333.38 | 22.5 | 11 | 8  | 133 | 117 |
| SAE4 | 402        | 361.95 | 381    | 15   | 11 | 8  | 133 | 117 |
| SAE3 | 451        | 409.58 | 428.62 | 15   | 11 | 8  | 145 | 129 |
| SAE2 | 489        | 447.68 | 466.72 | 15   | 11 | 12 | 172 | 156 |

| COUPLING DISC |        |        |   |    |      |
|---------------|--------|--------|---|----|------|
| SAE           | BX     | P      | X | Y  | AH   |
| 11.5          | 352.42 | 333.38 | 8 | 11 | 39.6 |
| 10            | 314.32 | 295.28 | 8 | 11 | 53.8 |
| 8             | 263.52 | 244.48 | 6 | 11 | 62   |
| 7.5           | 241.3  | 222.25 | 8 | 9  | 30.2 |
| 6.5           | 215.9  | 200.02 | 6 | 9  | 30.2 |

Maranello designs, manufactures and markets the alternators which comply with the national and international standards. The alternator can be broadly used in the all-purposed application, such as backup, rental, telecom and marine, and also can be used in a.

### **Compliant with Standards**

Other certifications can be considered on request.

### **Electrical Features**

#### **Automatic Voltage Regulator (AVR)**

The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.

#### **2/3 Winding Pitch**

Effectively eliminates the effect of the third harmonics so as to avoid excessive neutral currents.

#### **Variable Voltage Output**

Standard voltage output can be achieved through the reconnectable 12 wire, and the beyond-the-standard voltage might be achieved by optional winding.

#### **Overload Capability**

Be capable of running at constant load limited to the insulation class with the possibility of overload up to 10% for 1 hour every 12 hours.( Continuous Duty -S1).

#### **High Efficiency and Motor Starting Capacity**

Optimizing design greatly improves the efficiency and motor starting capacity.

### **Mechanical Features**

#### **Bracket + Flexible Disc**

The combination of casting bracket and flexible disc makes product to be coupled with any brand of engine whose interface is international design

#### **Terminal Box**

Metal-made and accessed easily, it also can be customized on requests.

#### **Shaft and Key**

Rotors assembly is dynamically balanced under ISO8528 and BS5000 regulation, and double-bearing is balanced with half-key.

#### **Bearing**

Bearing is greased in the factory for life, and regreasable bearing is available on request.

#### **Machine Protection**

The standard protection is IP23, and IP44 is optional

### **Insulation and Impregnation**

#### **H-class Insulation**

Materials used in the insulation system is classed "H", specially the copper wire applied is able to withstand 200°C

#### **Vacuum Pressure Impregnation (VPI)**

The advanced impregnation equipment is applied to ensure the electrical insulation and mechanical strength.

### **Winding Protection**

#### **Standard:**

The winding is protected against relative humidity < 95%.

#### **Optional:**

The special-treated winding ("ANTI-HARSH") is recommended to apply for the environment humidity > 95%, or harsh environment such as atmospheric contaminants or salty water spr