1. Cooling systems

Standard construction electric motors are closed and self-ventilated with a fan mounted to the motor shaft which operates in both directions of rotation. This cooling system, per IEC 60034-6, is designated IC411. Standard construction electric motors are constructed so that with IC411 cooling, duty is S1; this duty is guaranteed if the fan cover intake grille is not blocked by dirt deposited during operation or due to the installation itself (for example, inside the frame of a machine); such situations of poor ventilation must be carefully analysed to avoid compromising the motor’s performance. If the cooling system is IC418 (e.g. motor driving a fan and cooled by the resulting current of air), standard motors can be used in non-ventilated construction and S1 duty; naturally the speed and flow of air must be at least equivalent to that of the IC411 system. In case of total lack of external surface ventilation (IC410) standard motors may be used only for limited duration or very periodic duty. In such conditions the standard duty is S2 10 min or S3 10%. On request, motors can be provided without ventilation for S1 duty; the power, for a given motor size, is reduced to around 1/3 of the power available in S1 duty for IC411 motors. Contact our technical service for further information.
2. Forced ventilation

In the case of applications of the variable speed motor, it may be necessary to resort to forced ventilation (cooling method IC416), obtained by means of an axial flow servo-fan whose air flow rate is independent of the speed of rotation of the drive shaft. The supply, independent from the electric motor, is given by means of a connector applied directly on fan cover (single phase version 230V 50-60Hz, sizes 63-90), or by means of a separate terminal box cover applied on fan cover (single-phase 230V 50-60Hz sizes 100-132/160S and three-phase 380/420-380/480V 50-60Hz sizes 100-132/160S). On request, we can analyse different solutions, or for special power voltages. Use of the servo-fan is recommended for motor speeds much lower than the nominal speed, when the air flow rate of the standard fan would be insufficient for correct cooling, and for much higher speeds than the nominal speed, when the losses due to ventilation of the standard fan would no longer be negligible compared to the nominal load and also the noise of ventilation would be annoying. Forced ventilation could be necessary in case of frequent starting torques, as this condition entails a high heating and a low heat dissipation by the fan fitted on motor shaft. The speed limit which determines the need for forced ventilation depends on the load conditions to which the electric motor is subjected, in relation to the speed and duty type. Forced ventilation has been designed as a kit; therefore it is possible to modify a standard selfventilated electric motor (IC411) into a motor with forced ventilation (IC416) by following these simple instructions:

- disassemble the standard fan cover, unscrewing the fastening screws from the motor casing;
- remove the fastening bush of the plastic fan and remove the fan with the help of a tool;
- assemble the forced ventilation kit by tightening to the motor casing with the fastening screws of the fan cover just disassembled.

On request it is possible to supply forced ventilated motors with forced ventilation supply directly from the terminal box of the motor; in this case the forced ventilated unit cannot be supplied as a kit, but it should be ordered together with the complete motor. The application of the forced ventilation kit determines a length variation of the motor (see dimensional tables). Forced ventilation is not available for protection ratings higher than IP55 or in combination with high or low temperature.

<table>
<thead>
<tr>
<th>[V] / [Hz]</th>
<th>[W]</th>
<th>[A]</th>
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<tbody>
<tr>
<td>63</td>
<td>230V/50-60Hz</td>
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</tr>
<tr>
<td>71</td>
<td>230V/50-60Hz</td>
<td>14-16</td>
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<tr>
<td>80</td>
<td>230V/50-60Hz</td>
<td>33-36</td>
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<tr>
<td>90</td>
<td>230V/50-60Hz</td>
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<tr>
<td>100</td>
<td>230V/50-60Hz</td>
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<tr>
<td>112</td>
<td>230V/50-60Hz</td>
<td>76-90</td>
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<tr>
<td>132-160S</td>
<td>230V/50-60Hz</td>
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<tr>
<td>100</td>
<td>380-420V/50Hz</td>
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<tr>
<td>132-160S</td>
<td>380-420V/50Hz</td>
<td>55-60</td>
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</table>
Single-phase power sizes 63-71-80-90

Single- and three-phase power sizes 100-112-132

1. Connector mPm B202000N2 DIN 43650-A/ISO 4400
2. Cable gland M16x1.5 – Cable entry diameter 5-10 mm
3. Three-phase power 400V
4. Single-phase power 230V