

 **MAVILOR**

INFRANOR GROUP COMPANY



## Motors

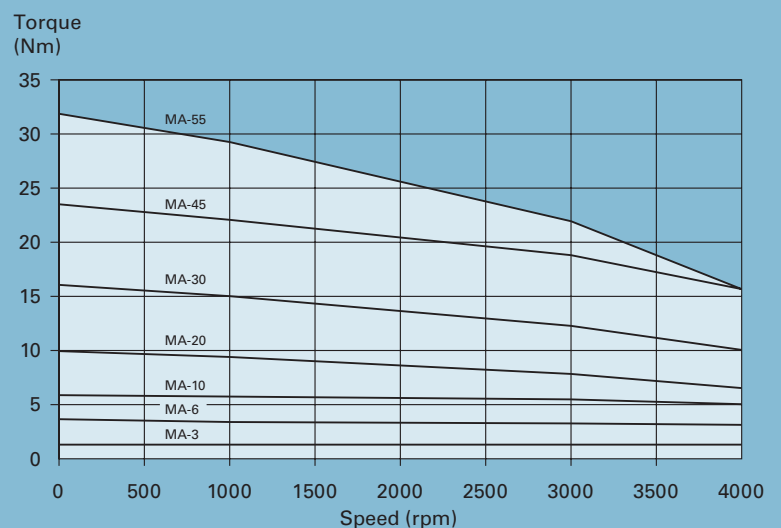
ISSUE 2001

# AC Servo Motors MA Series

- The short mechanical time constant makes it ideal for control operations.
- An extremely short electrical constant provides high peak torque at high speed.
- A high "theoretical" acceleration gives an extremely fast response time.
- High stall torque due to the absence of commutators bars.
- Low thermal resistance provides low working temperatures.
- High power to weight ratio, ideal for manipulator mounted motors.
- Air gap design, small diameter and short length.
- For many applications a separate position sensor is not required, the resolver can be used for deriving a position feed back signal as well as speed/current information.



## Performance Curves



## Technical Specifications

| ALL CHARACTERISTICS MEASURED<br>AT 25°C AMBIENT TEMPERATURE |                 |                                    | MA-3       | MA-6       | MA-10 | MA-20 | MA-30      | MA-45 | MA-55 |
|---|-----------------|------------------------------------|------------|------------|-------|-------|------------|-------|-------|
|   | SYMBOLS         | UNITS                              |            |            |       |       |            |       |       |
| MAX MECHANICAL SPEED  | n               | rpm                                | 9000       | 6000       | 6000  | 6000  | 6000       | 6000  | 6000  |
| STALL TORQUE <sup>(1)</sup> ±10%                            | M <sub>S</sub>  | Nm                                 | 1.3        | 3.6        | 5.8   | 10.0  | 16.0       | 23.4  | 31.8  |
| STALL CURRENT   | I <sub>S</sub>  | A                                  | 2.2        | 4.2        | 6.8   | 10.3  | 16.5       | 24.1  | 32.7  |
| PEAK TORQUE ±10%  | M <sub>J</sub>  | Nm                                 | 5.2        | 28.5       | 40.7  | 69.8  | 96.0       | 140.5 | 190.8 |
| TORQUE-WEIGHT RATIO ±10%                                    | T <sub>W</sub>  | Nm/kg                              | 0.7        | 0.8        | 1.1   | 1.2   | 1.6        | 1.7   | 1.9   |
| EMF CONSTANT ±5%  | K <sub>E</sub>  | Vs/rad                             | 0.3        | 0.5        | 0.5   | 0.6   | 0.6        | 0.6   | 0.6   |
| TORQUE CONSTANT ±5%   | K <sub>T</sub>  | Nm/A                               | 0.6        | 0.9        | 0.9   | 1.0   | 1.0        | 1.0   | 1.0   |
| RELUCTANCE TORQUE ±10%                                      | T <sub>R</sub>  | Nm                                 | <0.02      | <0.1       | <0.1  | <0.2  | <0.3       | <0.4  | <0.6  |
| WINDING RESISTANCE ±5%                                      | R               | Ω                                  | 10.2       | 5.3        | 2.2   | 1.4   | 0.5        | 0.4   | 0.2   |
| WINDING INDUCTANCE ±5%                                      | L               | mH                                 | 25.0       | 11.6       | 8.0   | 7.0   | 4.0        | 2.7   | 1.9   |
| ROTOR INERTIA   | J               | kg m <sup>2</sup> 10 <sup>-3</sup> | 0.04       | 0.30       | 0.40  | 0.80  | 1.60       | 2.20  | 3.60  |
| MECHANICAL TIME CONSTANT                                    | T <sub>M</sub>  | ms                                 | 2.0        | 3.8        | 2.1   | 2.1   | 1.6        | 1.6   | 1.6   |
| ELECTRICAL TIME CONSTANT                                    | T <sub>E</sub>  | ms                                 | 2.5        | 2.2        | 3.6   | 5.0   | 7.5        | 6.6   | 7.6   |
| THERMAL TIME CONSTANT                                       | T <sub>TH</sub> | s                                  | 1,500      | 1,500      | 1,800 | 1,500 | 1,500      | 1,500 | 1,500 |
| THERMAL RESISTANCE  | R <sub>TH</sub> | °C/W                               | 1.1        | 0.6        | 0.5   | 0.4   | 0.4        | 0.2   | 0.2   |
| MASS (motor with resolver)                                  | M               | kg                                 | 1.9        | 4.4        | 5.3   | 8.2   | 10.0       | 14.0  | 16.8  |
| RADIAL LOAD (at mid-length of shaft)                        | F <sub>R</sub>  | N                                  | 218        | 410        | 410   | 600   | 600        | 830   | 830   |
| AXIAL LOAD  | F <sub>A</sub>  | N                                  | 218        | 225        | 225   | 390   | 390        | 410   | 410   |
| INSULATION  | CLASS-F         |                                    |            |            |       |       |            |       |       |
| PROTECTION  | IP-54           |                                    |            |            |       |       |            |       |       |
| (1) With an aluminium heat sink plate                       |                 |                                    | 300x300x10 | 400x400x10 |       |       | 830x830x10 |       |       |

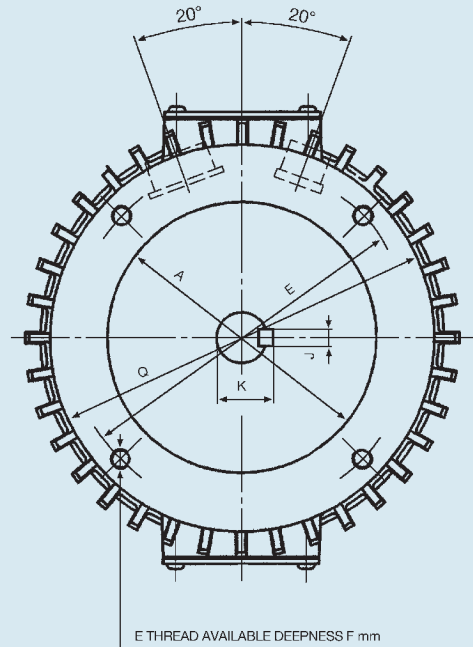
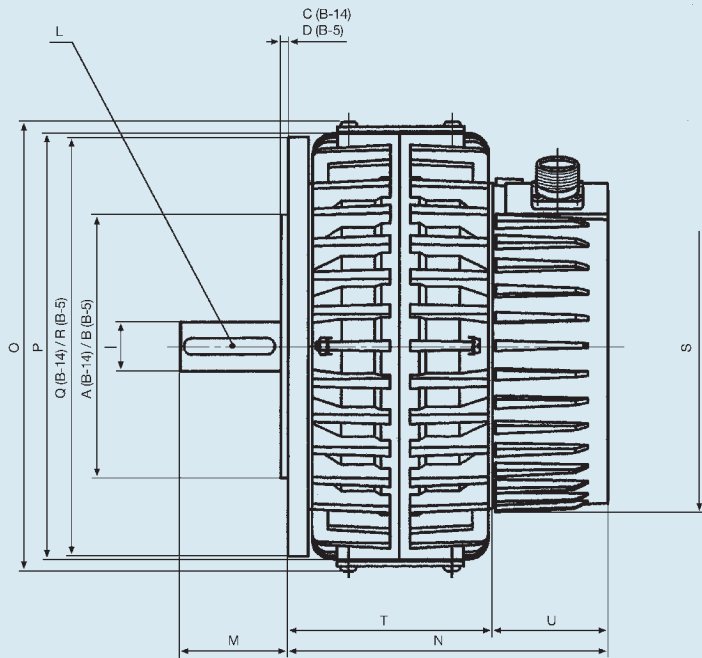
## Resolver Specifications

|                             | UNITS                              | 2T8<br>(Transmitter Speed 1) |
|-----------------------------|------------------------------------|------------------------------|
| Input Voltage/Frequency     | V/kHz                              | 10/4.5                       |
| Primary Element             |                                    | Rotor                        |
| Number of Speed             |                                    | 1X                           |
| Transformation Ratio        |                                    | 0.5 ± 5%                     |
| Electrical Error            | minutes                            | ±10 max.                     |
| Dielectric Strength         | VAC/1 minute                       | 500                          |
| Mass                        | kg                                 | 0.230                        |
| Rotor Moment of Inertia     | kg m <sup>2</sup> 10 <sup>-3</sup> | 0.0123                       |
| Operating Temperature Range | °C                                 | -55 ~ +155                   |

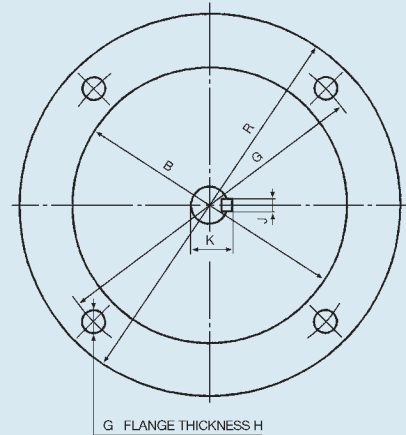
## Brake Specifications

|                   | SIZE   | TORQUE<br>Nm | INERTIA<br>kg cm <sup>2</sup> | MASS<br>kg |
|-------------------|--------|--------------|-------------------------------|------------|
| <b>MA-3</b>       | 07 (*) | 1            | 0.08                          | 0.3        |
| <b>MA-6 / 10</b>  | 10     | 4            | 0.30                          | 0.8        |
| <b>MA-20 / 30</b> | 10     | 8            | 0.30                          | 0.8        |
| <b>MA-45 / 55</b> | 10     | 12           | 0.30                          | 0.8        |
| (*) With chopper  |        |              |                               |            |

The MA Series incorporates the option of a fail-safe holding brake within the structure of the motor which holds the shaft without backlash on loss of electric current.

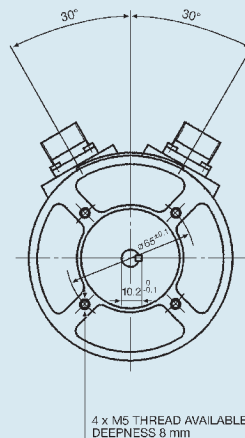
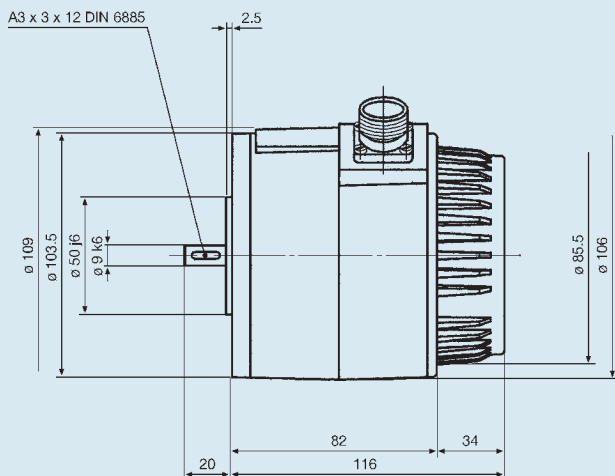


FLANGE B-14

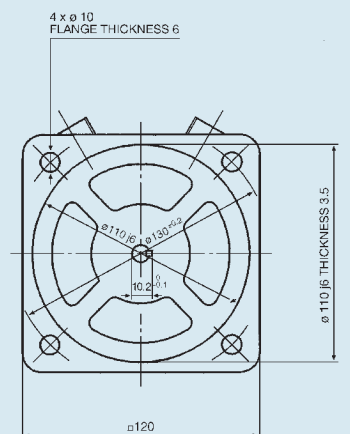


FLANGE B-5 (OPTIONAL)

**MA-3**



FLANGE B-14

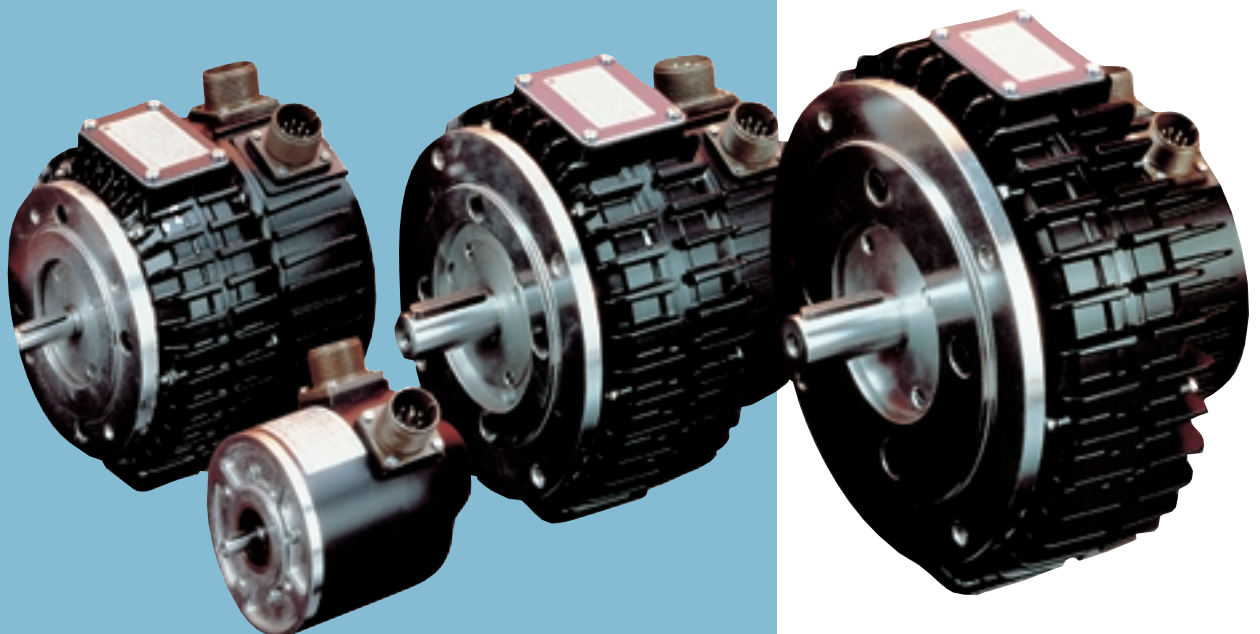


FLANGE B-5 (OPTIONAL)

# AC Servo Motors MA Series

## Dimensions

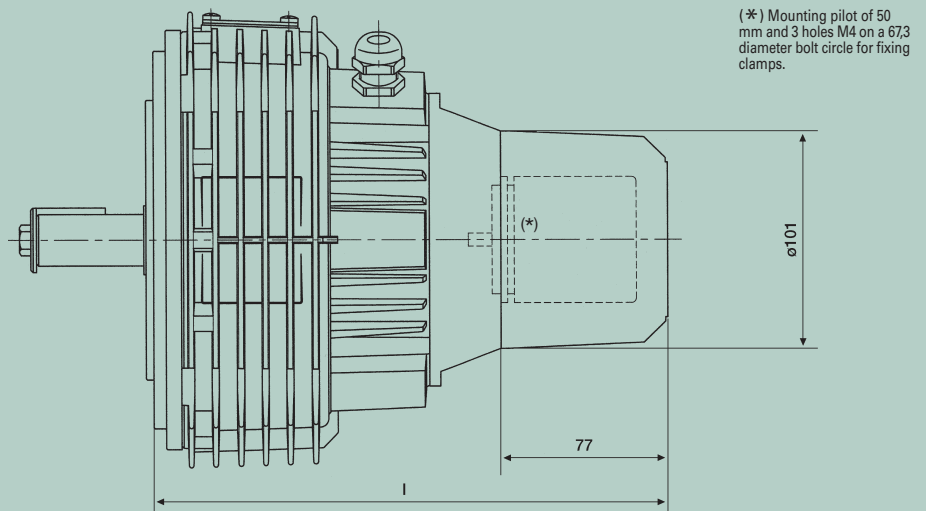
|                     | MA-6          | MA-10 | MA-20         | MA-30         | MA-45         | MA-55 |
|---------------------|---------------|-------|---------------|---------------|---------------|-------|
| A (j6)              | ø95           |       | ø130          |               | ø180          |       |
| B (j6)              | ø180          |       |               | ø250          |               |       |
| C                   | 3             |       | 3.5           |               | 4             |       |
| D                   | 4             |       |               | 5             |               |       |
| E                   | ø115<br>4xM8  |       | ø165<br>4xM10 |               | ø215<br>4xM12 |       |
| F                   | 10            |       |               | 12            |               |       |
| G                   | ø215<br>4xø15 |       |               | ø300<br>4xø19 |               |       |
| H                   | 10            |       |               | 17            |               |       |
| I (k6)              | ø14           |       | ø24           |               | ø28           |       |
| J (N9)              | 5             |       | 8             |               |               |       |
| K ( $\frac{3}{1}$ ) | 16            |       | 27            |               | 31            |       |
| L (DIN 6885)        | A5x5x28       |       | A8x7x45       |               | A8x7x50       |       |
| M                   | 34            |       | 50            |               | 60            |       |
| N                   | 137.5         |       | 152.5         |               | 161.5         |       |
| O                   | ø178          |       | ø218          |               | ø278          |       |
| P                   | ø170          |       | ø210          |               | ø270          |       |
| Q                   | ø140          |       | ø186          |               | ø242          |       |
| R                   | ø250          |       |               | □265          |               |       |
| S                   | ø165          |       |               |               |               |       |
| T                   | 80            |       | 95            |               | 104           |       |
| U                   | 57.5          |       |               |               |               |       |



# Optional Accessories

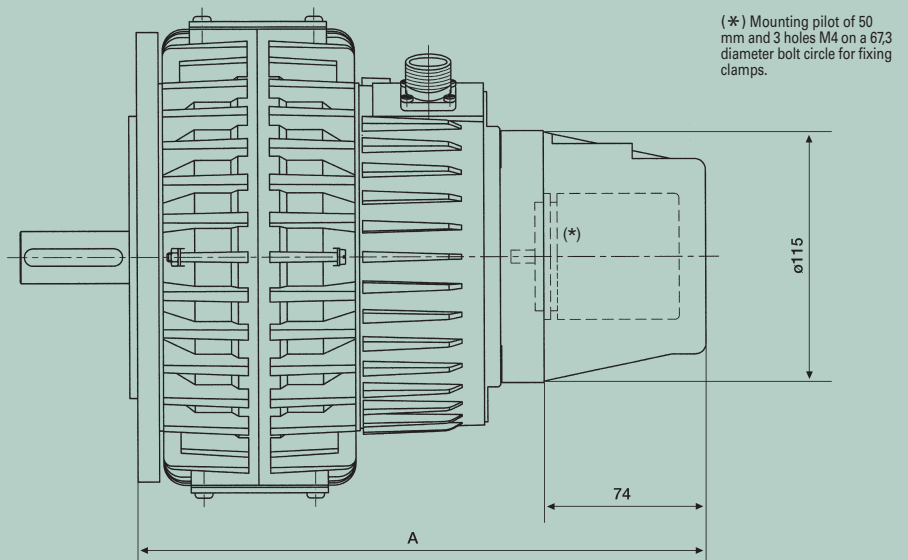
## MSS Encoder Kit (no encoder)

|               | l     |
|---------------|-------|
| <b>MSS-2</b>  | 235   |
| <b>MSS-4</b>  | 233   |
| <b>MSS-6</b>  | 233   |
| <b>MSS-8</b>  | 243.5 |
| <b>MSS-12</b> | 237.5 |
| <b>MSS-22</b> | 265.5 |
| <b>MSS-35</b> | 291   |
| <b>MSS-45</b> | 291   |



## MA Encoder Kit (no encoder)

|              | A     |
|--------------|-------|
| <b>MA-6</b>  | 237.5 |
| <b>MA-10</b> | 237.5 |
| <b>MA-20</b> | 252.5 |
| <b>MA-30</b> | 261.5 |
| <b>MA-45</b> | 274   |
| <b>MA-55</b> | 274   |



## BL 110/140 Encoder Kit (no encoder)

|               | A   |
|---------------|-----|
| <b>BL-111</b> | 282 |
| <b>BL-112</b> | 307 |
| <b>BL-113</b> | 332 |
| <b>BL-114</b> | 357 |
| <b>BL-115</b> | 382 |
| <b>BL-141</b> | 346 |
| <b>BL-142</b> | 367 |
| <b>BL-143</b> | 411 |
| <b>BL-144</b> | 453 |

