

## Stepper motors EMMS-ST

**FESTO**



## Stepper motors EMMS-ST

Key features

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### Everything from a single source

Stepper motors EMMS-ST

→ 4



- 2-phase hybrid technology
- Sinusoidal current impressing
- Optionally integrated encoder for “Servo Lite operation” (closed loop)
- Optionally with holding brake
- Protection class: IP54

### Gear unit EMGA-SST

→ 11



- Spur toothed planetary gearing
- Gear unit ratio: 3:1 and 5:1, available ex-stock
- Life lubrication
- Protection class: IP54

### Motor controller CMMS-ST

→ Internet: [cmms-st](http://cmms-st)



- Positioning controller with setpoint specifications for positions, rotational speed and torque
- “Servo Lite operation” (closed loop) with encoder option, in other words no step losses, current following errors are corrected
- Interfaces:
  - I/O interface
  - CANopen
  - Profibus DP
  - DeviceNet

### Power supply units SVG

→ Internet: [svg](http://svg)



- Robust hardware
- Input voltage 230 V AC/115 V AC
- Output voltage 24, 48 V DC
- Output current 5, 10, 20 A

### Motor and encoder cables NEBM

→ 12



- Screened cables
- Suitable for chain link trunking
- Protection class IP67

### Axial kits EAMM

→ Internet: [eamm](http://eamm)



- Specified kits for all electromechanical axes from Festo

# Stepper motors EMMS-ST

Type codes

|                                        |                     |      |   |    |   |    |   |   |   |     |
|----------------------------------------|---------------------|------|---|----|---|----|---|---|---|-----|
|                                        |                     | EMMS | – | ST | – | 42 | – | S | – | SEB |
| <b>Type</b>                            |                     |      |   |    |   |    |   |   |   |     |
| EMMS                                   | Motor               |      |   |    |   |    |   |   |   |     |
| <b>Motor type</b>                      |                     |      |   |    |   |    |   |   |   |     |
| ST                                     | Stepper motor       |      |   |    |   |    |   |   |   |     |
| <b>Flange dimensions</b>               |                     |      |   |    |   |    |   |   |   |     |
| 42                                     | 42 mm               |      |   |    |   |    |   |   |   |     |
| 57                                     | 57 mm               |      |   |    |   |    |   |   |   |     |
| 87                                     | 87 mm               |      |   |    |   |    |   |   |   |     |
| <b>Gradation of the overall length</b> |                     |      |   |    |   |    |   |   |   |     |
| S                                      | Small               |      |   |    |   |    |   |   |   |     |
| M                                      | Medium              |      |   |    |   |    |   |   |   |     |
| L                                      | Large               |      |   |    |   |    |   |   |   |     |
| <b>Additional function</b>             |                     |      |   |    |   |    |   |   |   |     |
| S                                      | Straight connection |      |   |    |   |    |   |   |   |     |
| E                                      | Encoder             |      |   |    |   |    |   |   |   |     |
| B                                      | Brake               |      |   |    |   |    |   |   |   |     |

# Stepper motors EMMS-ST

Technical data

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| General technical data          |                      |                           |
|---------------------------------|----------------------|---------------------------|
| Size                            |                      | 42                        |
| Motor                           |                      |                           |
| Nominal voltage                 | [V DC]               | 48                        |
| Nominal current                 | [A]                  | 1.8                       |
| Holding torque                  | [Nm]                 | 0.5                       |
| Stepper angle                   | [°]                  | 1.8 ±5%                   |
| Winding resistance              | [Ω]                  | 1.75 ±10%                 |
| Winding inductance              | [mH]                 | 5.4                       |
| Drive mass moment of inertia    | [kgcm <sup>2</sup> ] | 0.082/0.095 <sup>1)</sup> |
| Radial load on shaft            | [N]                  | 20                        |
| Axial load on shaft             | [N]                  | 7                         |
| Mass moment of inertia of rotor | [kgcm <sup>2</sup> ] | 0.082                     |
| Brake                           |                      |                           |
| Operating voltage               | [V DC]               | 24 ±10%                   |
| Output                          | [W]                  | 8                         |
| Holding torque                  | [Nm]                 | 0.4                       |
| Mass moment of inertia          | [kgcm <sup>2</sup> ] | 0.013                     |

1) With brake

| Size                            | 57-S                 | 57-M                    |
|---------------------------------|----------------------|-------------------------|
| Motor                           |                      |                         |
| Nominal voltage                 | [V DC]               | 48                      |
| Nominal current                 | [A]                  | 5                       |
| Holding torque                  | [Nm]                 | 0.8                     |
| Stepper angle                   | [°]                  | 1.8 ±5%                 |
| Winding resistance              | [Ω]                  | 0.15 ±10%               |
| Winding inductance              | [mH]                 | 0.5                     |
| Drive mass moment of inertia    | [kgcm <sup>2</sup> ] | 0.29/0.30 <sup>1)</sup> |
| Radial load on shaft            | [N]                  | 52                      |
| Axial load on shaft             | [N]                  | 10                      |
| Mass moment of inertia of rotor | [kgcm <sup>2</sup> ] | 0.29                    |
| Brake                           |                      |                         |
| Operating voltage               | [V DC]               | 24 ±10%                 |
| Output                          | [W]                  | 8                       |
| Holding torque                  | [Nm]                 | 0.4                     |
| Mass moment of inertia          | [kgcm <sup>2</sup> ] | 0.01                    |

1) With brake

# Stepper motors EMMS-ST

Technical data

| General technical data                               |                      |                        |                      |
|------------------------------------------------------|----------------------|------------------------|----------------------|
| Size                                                 | 87-S                 | 87-M                   | 87-L                 |
| Motor                                                |                      |                        |                      |
| Nominal voltage [V DC]                               | 48                   |                        |                      |
| Nominal current [A]                                  | 9.5                  |                        |                      |
| Holding torque [Nm]                                  | 2.5                  | 5.9                    | 9.3                  |
| Stepper angle [°]                                    | 1.8 ±5%              |                        |                      |
| Winding resistance [Ω]                               | 0.1 ±10%             | 0.23 ±10%              | 0.23 ±10%            |
| Winding inductance [mH]                              | 0.45                 | 2.6                    | 2.7                  |
| Drive mass moment of inertia [kgcm <sup>2</sup> ]    | 1/1.07 <sup>1)</sup> | 1.9/1.97 <sup>1)</sup> | 3/3.07 <sup>1)</sup> |
| Radial load on shaft [N]                             | 200                  |                        |                      |
| Axial load on shaft [N]                              | 65                   |                        |                      |
| Mass moment of inertia of rotor [kgcm <sup>2</sup> ] | 1                    | 1.9                    | 3                    |
| Brake                                                |                      |                        |                      |
| Operating voltage [V DC]                             | 24 ±10%              |                        |                      |
| Output [W]                                           | 11                   |                        |                      |
| Holding torque [Nm]                                  | 2                    |                        |                      |
| Mass moment of inertia [kgcm <sup>2</sup> ]          | 0.07                 |                        |                      |

1) With brake

| Technical data – Encoder |                |  |
|--------------------------|----------------|--|
| Encoder, optical         |                |  |
| Operating voltage [V DC] | 5              |  |
| Pulses/revolution [rpm]  | 500            |  |
| Zero pulse               | Yes            |  |
| Line driver              | RS422 protocol |  |

| Weight [g]             |     |       |       |       |       |       |
|------------------------|-----|-------|-------|-------|-------|-------|
| Size                   | 42  | 57-S  | 57-M  | 87-S  | 87-M  | 87-L  |
| Product weight         | 360 | 870   | 1,100 | 1,950 | 3,050 | 4,200 |
| With encoder           | 450 | 970   | 1,200 | 2,100 | 3,200 | 4,350 |
| With brake             | 540 | 1,090 | 1,320 | 2,350 | 3,450 | 4,600 |
| With encoder and brake | 600 | 1,150 | 1,380 | 2,500 | 3,600 | 5,000 |

| Operating and environmental conditions        |                                     |
|-----------------------------------------------|-------------------------------------|
| Insulation protection class to VDE 60034      | B                                   |
| Protection class                              | IP54                                |
| Ambient temperature [°C]                      | –10 ... +50                         |
| Storage temperature [°C]                      | –20 ... +70                         |
| CE mark (see declaration of conformity)       | In accordance with EU EMC directive |
| Relative air humidity [%]<br>(non-condensing) | 45 ... 80                           |

# Stepper motors EMMS-ST

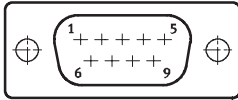
Technical data

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## Pin allocation

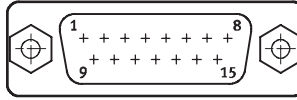
Motor connection

Size 42, 57



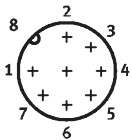
| PIN | Function     |
|-----|--------------|
| 1   | String A     |
| 2   | String A/    |
| 3   | String B     |
| 4   | String B/    |
| 5   | –            |
| 6   | –            |
| 7   | Brake (24 V) |
| 8   | Brake (0 V)  |
| 9   | –            |
|     |              |

Size 87



| PIN | Function     |
|-----|--------------|
| 1   | String A     |
| 2   | String A     |
| 3   | String A/    |
| 4   | String A/    |
| 5   | String B     |
| 6   | String B     |
| 7   | String B/    |
| 8   | String B/    |
| 9   | –            |
| 10  | –            |
| 11  | Brake (24 V) |
| 12  | Brake (0 V)  |
| 13  | –            |
| 14  | –            |
| 15  | –            |

## Encoder connection



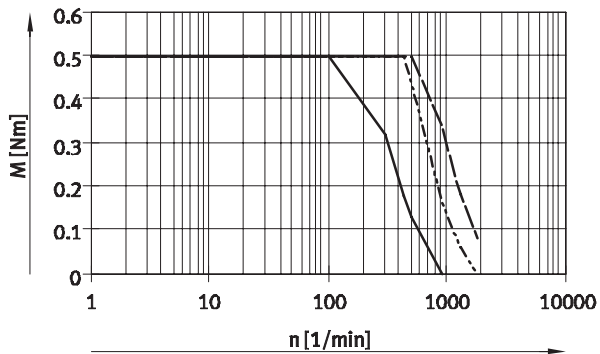
| PIN | Function        |
|-----|-----------------|
| 1   | Signal trace A  |
| 2   | Signal trace A/ |
| 3   | Signal trace B  |
| 4   | Signal trace B/ |
| 5   | 0 V             |
| 6   | Signal trace N  |
| 7   | Signal trace N/ |
| 8   | 5 V             |

# Stepper motors EMMS-ST

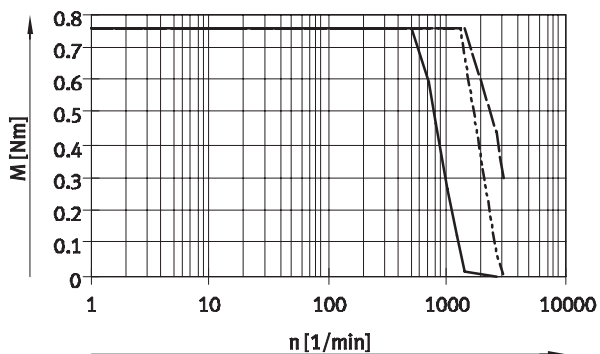
Technical data

## Torque M as a function of rotational speed n

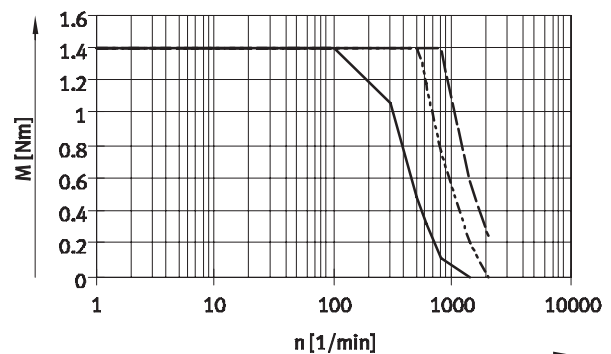
EMMS-ST-42



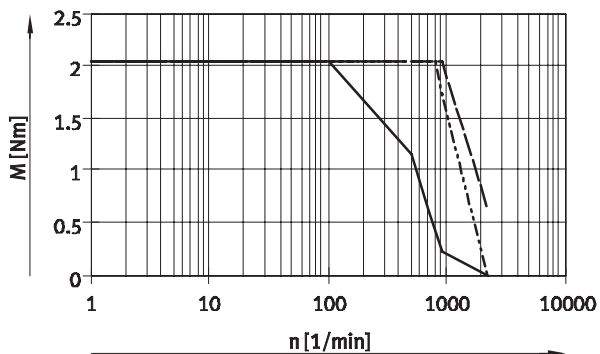
EMMS-ST-57-S



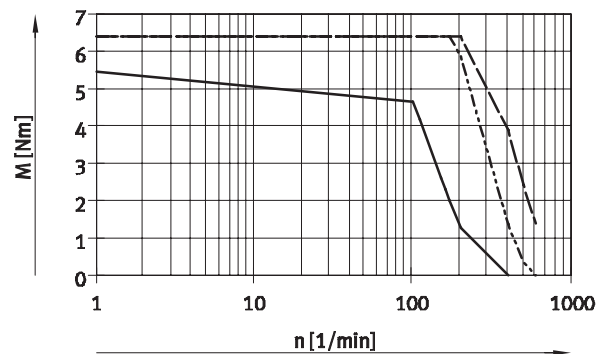
EMMS-ST-57-M



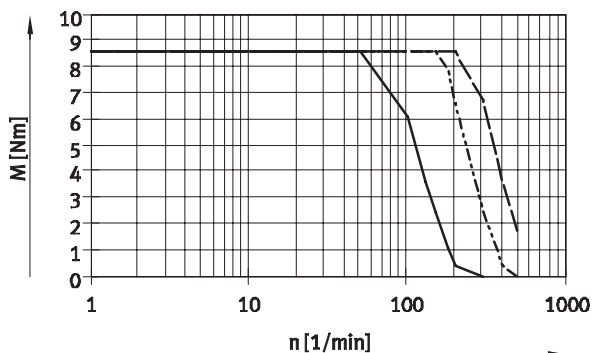
EMMS-ST-87-S



EMMS-ST-87-M



EMMS-ST-87-L



— 24VDC  
- - - 48VDC  
- · - 72VDC

 Note

The characteristic curves apply in combination with the motor controller CMMS-ST.  
The size EMMS-ST-87 is operated with the motor controller CMMS-ST with max. 8 A.

# Stepper motors EMMS-ST

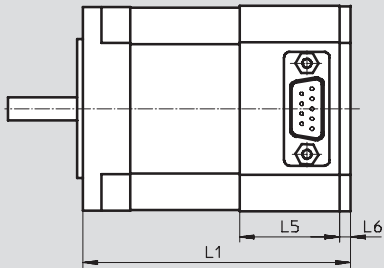
Technical data

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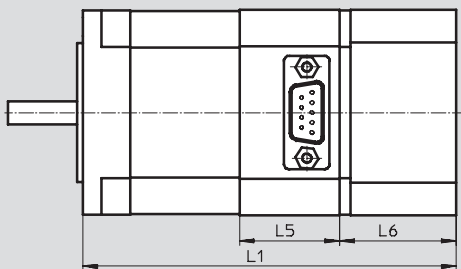
## Dimensions

Download CAD data → [www.festo.com](http://www.festo.com)

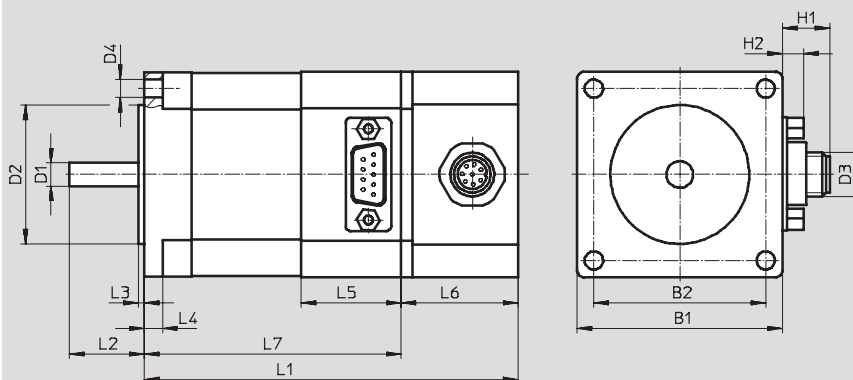
### EMMS-ST-...-S



### EMMS-ST-...-SB

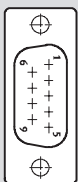


### EMMS-ST-...-SE/SEB

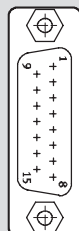


## Plug assignment

9-pin Sub-D plug  
with size 42, 57



15-pin Sub-D plug  
with size 87



# Stepper motors EMMS-ST

Technical data

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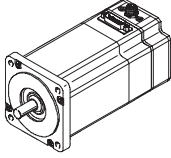
| Type             | B1   | B2    | D1<br>Ø    | D2<br>Ø    | D3  | D4<br>Ø | H1 | H2  |
|------------------|------|-------|------------|------------|-----|---------|----|-----|
| EMMS-ST-42-S-S   | 42.3 | 31    | 5-0.012    | 22-0.05    | -   | M3x4.5  | -  | 6.5 |
| EMMS-ST-42-S-SE  |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-42-S-SB  |      |       |            |            | -   |         | -  |     |
| EMMS-ST-42-S-SEB |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-57-S-S   | 56.4 | 47.14 | 6.35-0.013 | 38.1±0.025 | -   | 5       | -  |     |
| EMMS-ST-57-S-SE  |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-57-S-SB  |      |       |            |            | -   |         | -  |     |
| EMMS-ST-57-S-SEB |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-57-M-S   |      |       |            |            | -   |         | -  |     |
| EMMS-ST-57-M-SE  |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-57-M-SB  |      |       |            |            | -   |         | -  |     |
| EMMS-ST-57-M-SEB |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-87-S-S   | 85.6 | 69.5  | 11-0.013   | 73-0.046   | -   | 6.6     | -  |     |
| EMMS-ST-87-S-SE  |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-87-S-SB  |      |       |            |            | -   |         | -  |     |
| EMMS-ST-87-S-SEB |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-87-M-S   |      |       |            |            | -   |         | -  |     |
| EMMS-ST-87-M-SE  |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-87-M-SB  |      |       |            |            | -   |         | -  |     |
| EMMS-ST-87-M-SEB |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-87-L-S   |      |       |            |            | -   |         | -  |     |
| EMMS-ST-87-L-SE  |      |       |            |            | M12 |         | 13 |     |
| EMMS-ST-87-L-SB  |      |       |            |            | -   |         | -  |     |
| EMMS-ST-87-L-SEB |      |       |            |            | M12 |         | 13 |     |

| Type             | L1    | L2       | L3  | L4   | L5   | L6   | L7       |
|------------------|-------|----------|-----|------|------|------|----------|
| EMMS-ST-42-S-S   | 66    | 24±1     | 2   | -    | 24   | 2    | -        |
| EMMS-ST-42-S-SE  | 94    |          |     |      |      | 30   | 64±1     |
| EMMS-ST-42-S-SB  | 114   |          |     |      |      | 50   |          |
| EMMS-ST-42-S-SEB | 127   |          |     |      |      | 63   |          |
| EMMS-ST-57-S-S   | 73.5  | 20.6±0.5 | 1.6 | 5    | 27.5 | 3    | -        |
| EMMS-ST-57-S-SE  | 102.5 |          |     |      |      | 32   | 70.5±0.8 |
| EMMS-ST-57-S-SB  | 123.5 |          |     |      |      | 53   |          |
| EMMS-ST-57-S-SEB | 138   |          |     |      |      | 64.5 |          |
| EMMS-ST-57-M-S   | 95    |          |     |      |      | 3    | -        |
| EMMS-ST-57-M-SE  | 124   |          |     |      |      | 32   | 92±0.8   |
| EMMS-ST-57-M-SB  | 145   |          |     |      |      | 53   |          |
| EMMS-ST-57-M-SEB | 159.5 |          |     |      |      | 67.5 |          |
| EMMS-ST-87-S-S   | 82.6  | 27±1     | 2   | 8.38 | 31.4 | 3    | -        |
| EMMS-ST-87-S-SE  | 112.6 |          |     |      |      | 33   | 79.6±1   |
| EMMS-ST-87-S-SB  | 132.6 |          |     |      |      | 53   |          |
| EMMS-ST-87-S-SEB | 152.6 |          |     |      |      | 73   |          |
| EMMS-ST-87-M-S   | 114.9 |          |     |      |      | 3    | -        |
| EMMS-ST-87-M-SE  | 144.9 |          |     |      |      | 33   | 111.9±1  |
| EMMS-ST-87-M-SB  | 164.9 |          |     |      |      | 53   |          |
| EMMS-ST-87-M-SEB | 184.9 |          |     |      |      | 73   |          |
| EMMS-ST-87-L-S   | 144.9 |          |     |      |      | 3    | -        |
| EMMS-ST-87-L-SE  | 174.9 |          |     |      |      | 33   | 141.9±1  |
| EMMS-ST-87-L-SB  | 194.9 |          |     |      |      | 53   |          |
| EMMS-ST-87-L-SEB | 214.9 |          |     |      |      | 73   |          |

## Stepper motors EMMS-ST

Technical data

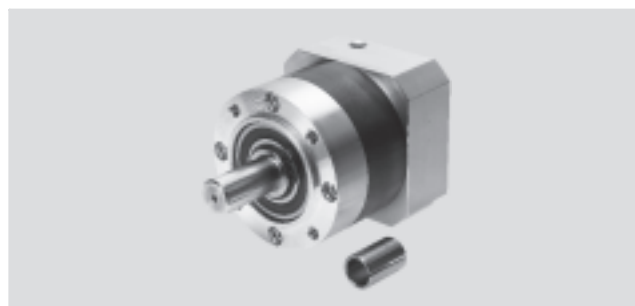
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| Ordering data                                                                     |      |               |              |            |                             |
|-----------------------------------------------------------------------------------|------|---------------|--------------|------------|-----------------------------|
|                                                                                   | Size | Variant       |              |            | Part No.    Type            |
|                                                                                   |      | Basic version | With encoder | With brake |                             |
|  | 42   | ■             |              |            | 549 404    EMMS-ST-42-S-S   |
|                                                                                   |      |               | ■            |            | 549 405    EMMS-ST-42-S-SE  |
|                                                                                   |      |               |              | ■          | 549 406    EMMS-ST-42-S-SB  |
|                                                                                   |      |               | ■            | ■          | 549 407    EMMS-ST-42-S-SEB |
|                                                                                   | 57   | ■             |              |            | 549 408    EMMS-ST-57-S-S   |
|                                                                                   |      |               | ■            |            | 549 409    EMMS-ST-57-S-SE  |
|                                                                                   |      |               |              | ■          | 549 410    EMMS-ST-57-S-SB  |
|                                                                                   |      |               | ■            | ■          | 549 411    EMMS-ST-57-S-SEB |
|                                                                                   |      | ■             |              |            | 549 412    EMMS-ST-57-M-S   |
|                                                                                   |      |               | ■            |            | 549 413    EMMS-ST-57-M-SE  |
|                                                                                   |      |               |              | ■          | 549 414    EMMS-ST-57-M-SB  |
|                                                                                   |      |               | ■            | ■          | 549 415    EMMS-ST-57-M-SEB |
|                                                                                   | 87   | ■             |              |            | 549 416    EMMS-ST-87-S-S   |
|                                                                                   |      |               | ■            |            | 549 417    EMMS-ST-87-S-SE  |
|                                                                                   |      |               |              | ■          | 549 418    EMMS-ST-87-S-SB  |
|                                                                                   |      |               | ■            | ■          | 549 419    EMMS-ST-87-S-SEB |
|                                                                                   |      | ■             |              |            | 549 420    EMMS-ST-87-M-S   |
|                                                                                   |      |               | ■            |            | 549 421    EMMS-ST-87-M-SE  |
|                                                                                   |      |               |              | ■          | 549 422    EMMS-ST-87-M-SB  |
|                                                                                   |      |               | ■            | ■          | 549 423    EMMS-ST-87-M-SEB |
|                                                                                   |      | ■             |              |            | 549 424    EMMS-ST-87-L-S   |
|                                                                                   |      |               | ■            |            | 549 425    EMMS-ST-87-L-SE  |
|                                                                                   |      |               |              | ■          | 549 426    EMMS-ST-87-L-SB  |
|                                                                                   |      |               | ■            | ■          | 549 427    EMMS-ST-87-L-SEB |

# Stepper motors EMMS-ST

Accessories

## Gear unit EMGA



| General technical data                 |                      |                |      |                |       |                |      |
|----------------------------------------|----------------------|----------------|------|----------------|-------|----------------|------|
| For motor size                         |                      | 42             |      | 57             |       | 87             |      |
| Gear unit type                         |                      | EMGA-40-P-G... |      | EMGA-60-P-G... |       | EMGA-80-P-G... |      |
| Gear unit ratio                        | [i]                  | 3              | 5    | 3              | 5     | 3              | 5    |
| Continuous output torque <sup>1)</sup> | [Nm]                 | 11             | 14   | 22             | 22    | 85             | 110  |
| Max. drive torque                      | [Nm]                 | 17.6           | 22   | 22             | 22    | 136            | 176  |
| Torsional resistance                   | [Nm/arcmin]          | 1              |      | 2.3            |       | 6              |      |
| Torsional backlash                     | [deg]                | 0.4            |      | 0.27           |       | 0.15           |      |
| Moment of inertia <sup>2)</sup>        | [kgcm <sup>2</sup> ] | 0.031          | 0.19 | 0.135          | 0.078 | 0.77           | 0.45 |
| Efficiency                             | [%]                  | 96             |      |                |       |                |      |
| Operating temperature <sup>3)</sup>    | [°C]                 | -25 ... +90    |      |                |       |                |      |
| Protection class                       |                      | IP54           |      |                |       |                |      |

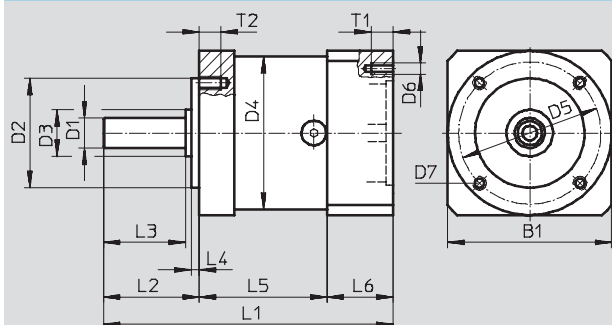
1) At the drive shaft

2) Referred to the drive shaft

3) Note the temperature range of the motor

## Dimensions

Download CAD data → [www.festo.com](http://www.festo.com)



| For size | B1 | D1<br>Ø<br>h7 | D2<br>Ø<br>h7 | D3<br>Ø | D4<br>Ø | D5<br>Ø | D6   | D7 | L1    | L2     | L3 | L4 | L5 | L6   | T1 | T2 |
|----------|----|---------------|---------------|---------|---------|---------|------|----|-------|--------|----|----|----|------|----|----|
| 42       | 40 | 10            | 26            | 12      | 40      | 34      | Ø3.4 | M4 | 92.5  | 26±0.6 | 23 | 2  | 39 | 27.5 | 5  | 6  |
| 57       | 60 | 11            | 40            | 17      | 60      | 52      | M4   | M5 | 106   | 35±0.8 | 30 | 3  | 47 | 24   | 8  | 8  |
| 87       | 90 | 20            | 60            | 25      | 80      | 70      | M5   | M6 | 135.5 | 40±0.8 | 36 | 3  | 60 | 35.5 | 12 | 10 |

## Ordering data

| For size | Gear unit ratio | Part No. | Type                |
|----------|-----------------|----------|---------------------|
| 42       | 3               | 549 428  | EMGA-40-P-G3-SST-42 |
|          | 5               | 549 429  | EMGA-40-P-G5-SST-42 |
| 57       | 3               | 549 430  | EMGA-60-P-G3-SST-57 |
|          | 5               | 549 431  | EMGA-60-P-G5-SST-57 |
| 87       | 3               | 549 432  | EMGA-80-P-G3-SST-87 |
|          | 5               | 549 433  | EMGA-80-P-G5-SST-87 |

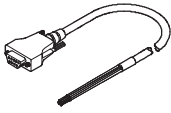
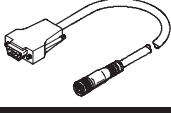
## Stepper motors EMMS-ST

Accessories

**FESTO**

| Technical data – Cables               |                         |                |                  |
|---------------------------------------|-------------------------|----------------|------------------|
| Designation                           | Motor cable             |                | Encoder cable    |
| Type                                  | NEBM-S1G9-...           | NEBM-S1G15-... | NEBM-M12G8-...   |
| For size                              | EMMS-ST-42/57           | EMMS-ST-87     | EMMS-ST-42/57/87 |
| Min. bending radius [mm]              | 58                      | 70             | 51               |
| Ambient temperature [°]               | –40 ... +70             | –30 ... +70    | –40 ... +70      |
| Ambient temperature <sup>1)</sup> [°] | –40 ... +70             | –5 ... +70     | –40 ... +70      |
| Cable design                          | Screened                |                |                  |
| Cable attribute                       | Suitable for drag chain |                |                  |
| Protection class                      | IP65                    |                |                  |
| Material                              | Polyurethane            |                |                  |

1) with flexible cable installation

| Ordering data                                                                       |                        |          |                       |
|-------------------------------------------------------------------------------------|------------------------|----------|-----------------------|
|                                                                                     | Cable length [m]       | Part No. | Type                  |
| Motor cable                                                                         |                        |          |                       |
|    | For EMMS-ST-42/57      |          |                       |
|                                                                                     | 5                      | 550 740  | NEBM-S1G9-E-5-LE6     |
|                                                                                     | 10                     | 550 741  | NEBM-S1G9-E-10-LE6    |
|                                                                                     | 15                     | 550 742  | NEBM-S1G9-E-15-LE6    |
|                                                                                     | X length <sup>1)</sup> | 550 743  | NEBM-S1G9-E-...-LE6   |
|                                                                                     | For EMMS-ST-87         |          |                       |
|                                                                                     | 5                      | 550 744  | NEBM-S1G15-E-5-LE6    |
|                                                                                     | 10                     | 550 745  | NEBM-S1G15-E-10-LE6   |
|                                                                                     | 15                     | 550 746  | NEBM-S1G15-E-15-LE6   |
|                                                                                     | X length <sup>1)</sup> | 550 747  | NEBM-S1G15-E-...-LE6  |
| Encoder cable                                                                       |                        |          |                       |
|  | 5                      | 550 748  | NEBM-M12G8-E-5-S1G9   |
|                                                                                     | 10                     | 550 749  | NEBM-M12G8-E-10-S1G9  |
|                                                                                     | 15                     | 550 750  | NEBM-M12G8-E-15-S1G9  |
|                                                                                     | X length <sup>1)</sup> | 550 751  | NEBM-M12G8-E-...-S1G9 |

1) Max. 25 m