Stepper motors EMMS-ST

FESTO

Stepper motors EMMS-ST

Key features

Everything from a single source

Stepper motors EMMS-ST ➔ 4

- Corresponds to IEC 60034
- 2-phase hybrid technology
- Optionally integrated encoder (closed loop)
- Sinusoidal current impressing
- Optionally with holding brake
- Protection class: IP54

Gear unit EMGA-SST ➔ 13

- Planetary gear unit
- Gear ratio i = 3 and 5, available ex-stock
- Other ratios and versions on request
- Life-time lubrication
- Protection class: IP54

Motor controller CMMS-ST ➔ Internet: cmms-st

- Position controller with setpoint specifications for position, speed and torque
- Integrated encoder (closed loop), 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

- Sturdy mechanical system
- 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 ➔ 14

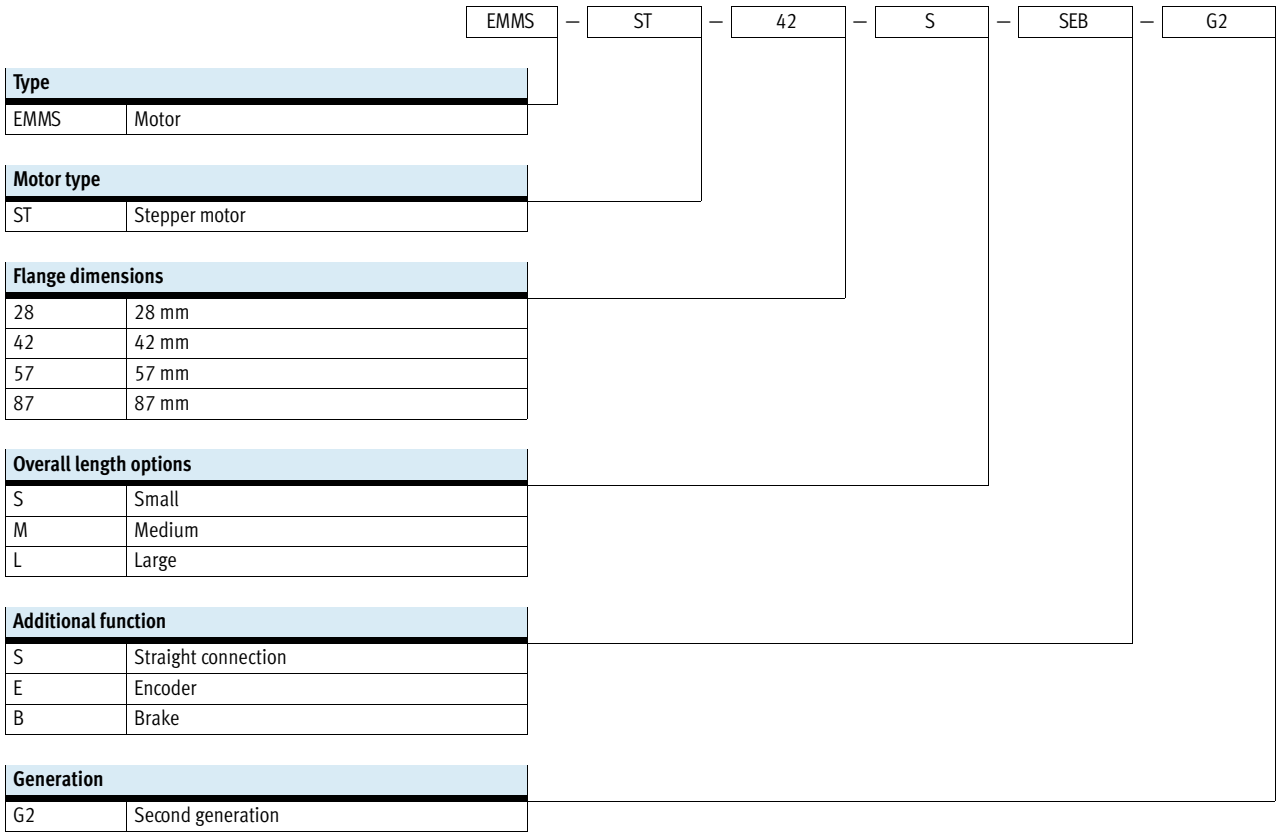
- Can be used in a wide temperature range
- Screened cables
- Suitable for use with energy chains
- Protection class IP65

Axial kits EAMM ➔ Internet: eamm

- Defined kits for all electro-mechanical axes from Festo

Stepper motors EMMS-ST

Type codes



Type	
EMMS	Motor

Motor type	
ST	Stepper motor

Flange dimensions	
28	28 mm
42	42 mm
57	57 mm
87	87 mm

Overall length options	
S	Small
M	Medium
L	Large

Additional function	
S	Straight connection
E	Encoder
B	Brake

Generation	
G2	Second generation

Stepper motors EMMS-ST

Technical data

General technical data			
Size		28	42
Motor			
Nominal voltage	[V DC]	48	48
Nominal current	[A]	1.4	1.8
Max. rotational speed[1]	[rpm]	6,000	1,740
Holding torque	[Nm]	0.09	0.5
Stepper angle	[°]	1.8 ±5%	1.8 ±5%
Winding resistance	[Ω]	2.3 ±15%	1.75 ±15%
Winding inductance	[mH]	1.4	3.3
Output mass moment of inertia	[kgcm²]	0.018/0.025[2]	0.082/0.095[2]
Radial load on shaft	[N]	20	20
Axial load on shaft	[N]	7	7
Mass moment of inertia of rotor	[kgcm²]	0.018	0.082
Brake			
Operating voltage	[V DC]	24 ±10%	24 ±10%
Power	[W]	8	8
Holding torque	[Nm]	0.2	0.4
Mass moment of inertia	[kgcm²]	0.007	0.013
Response delay	[ms]	2/6	2/6
Separation time	[ms]	10	10

1) Theoretical max. rotational speed while idling at nominal voltage
2) With brake

Size		57-S	57-M
Motor			
Nominal voltage	[V DC]	48	
Nominal current	[A]	5	
Max. rotational speed[1]	[rpm]	2,720	1,940
Holding torque	[Nm]	0.8	1.4
Stepper angle	[°]	1.8 ±5%	
Winding resistance	[Ω]	0.15 ±10%	0.25 ±10%
Winding inductance	[mH]	0.5	0.95
Output mass moment of inertia	[kgcm²]	0.29/0.30[2]	0.48/0.5[2]
Radial load on shaft	[N]	52	
Axial load on shaft	[N]	10	
Mass moment of inertia of rotor	[kgcm²]	0.29	0.48
Brake			
Operating voltage	[V DC]	24 ±10%	
Power	[W]	8	10
Holding torque	[Nm]	0.4	1
Mass moment of inertia	[kgcm²]	0.01	0.02
Response delay	[ms]	2/6	2/6
Separation time	[ms]	10	12

1) Theoretical max. rotational speed while idling at nominal voltage
2) 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		
Max. rotational speed[1]	[rpm]	2,130	550	430
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
Output mass moment of inertia	[kgcm²]	1/1.07[2]	1.9/1.97[2]	3/3.07[2]
Radial load on shaft	[N]	200		
Axial load on shaft	[N]	65		
Mass moment of inertia of rotor	[kgcm²]	1	1.9	3
Brake				
Operating voltage	[V DC]	24 ±10%		
Power	[W]	11		
Holding torque	[Nm]	2		
Mass moment of inertia	[kgcm²]	0.07		
Response delay	[ms]	2/6	2/6	2/6
Separation time	[ms]	25		

1) Theoretical max. rotational speed while idling at nominal voltage
2) With brake

Technical data – Encoder		
Rotary position encoder		Incremental
Rotary position encoder measuring principle		Opto-electrical
Pulses/revolution	[1/rev]	500
Interface		RS422, TTL, AB channel, zero index
Operating voltage	[V DC]	5

Weight [g]								
Size		28	42	57-S	57-M	87-S	87-M	87-L
Product weight		320	360	870	1,100	1,950	3,050	4,200
With encoder		380	450	970	1,200	2,100	3,200	4,350
With brake		320	540	1,090	1,320	2,350	3,450	4,600
With encoder and brake		380	600	1,150	1,380	2,500	3,600	5,000

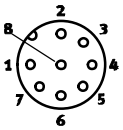
Operating and environmental conditions								
Size		28	42	57-S	57-M	87-S	87-M	87-L
Insulation protection class		B						
Heat class to EN 60034-1		B						
Rated class to EN 60034-1		S1						
Protection class: Motor shaft		IP54						
Protection class: Motor housing		IP65	IP54					
Ambient temperature	[°C]	–10 … +50						
Storage temperature	[°C]	–20 … +70						
Relative air humidity (non-condensing)	[%]	0 … 85						
CE marking (see declaration of conformity)		To EU EMC Directive[1]						
Certification		c UL us - Recognized (OL)						
		RCM trademark						
Note on materials		RoHS-compliant						

1) For information about the applicability of the component see the manufacturer's EC declaration of conformity at: www.festo.com/sp ➔ User documentation.
If the component is subject to restrictions on usage in residential, office or commercial environments or small businesses, further measures to reduce the emitted interference may be necessary.

Pin allocation

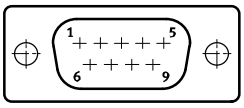
Motor connection

Size 28

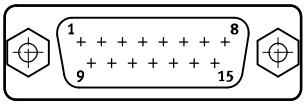


Pin	Function
1	String A
2	String A/
3	String B
4	String B/
5	n.c.
6	n.c.
7	Brake (24 V)
8	Brake (0 V)
9	–

Size 42, 57

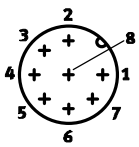


Size 87



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	n.c.
10	n.c.
11	Brake (24 V)
12	Brake (0 V)
13	n.c.
14	n.c.
15	n.c.

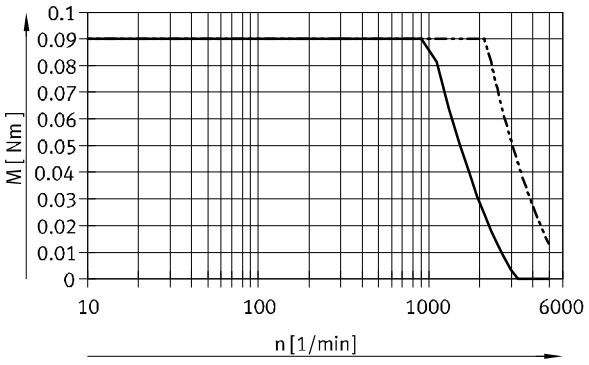
Encoder connection



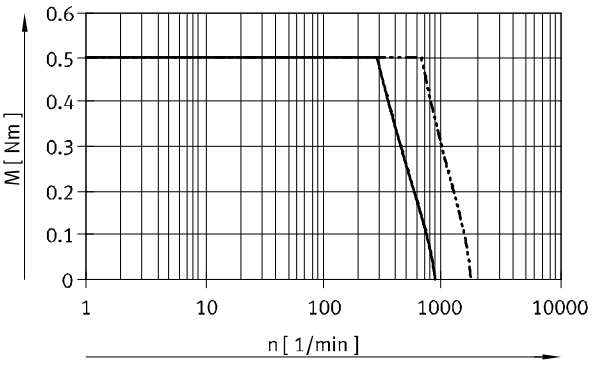
Pin	Function
1	Signal trace A
2	Signal trace A/
3	Signal trace B
4	Signal trace B/
5	0 V
6	Signal trace N
7	Signal trace N/
8	5 V

Torque M as a function of rotational speed n

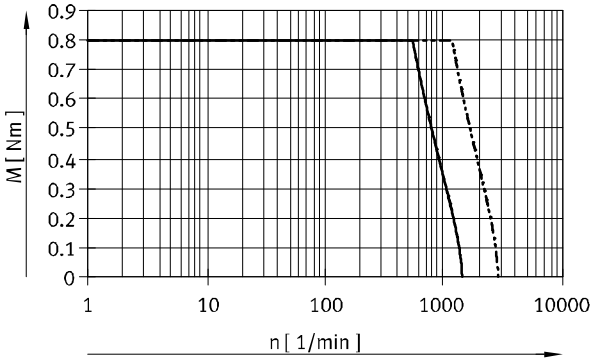
EMMS-ST-28



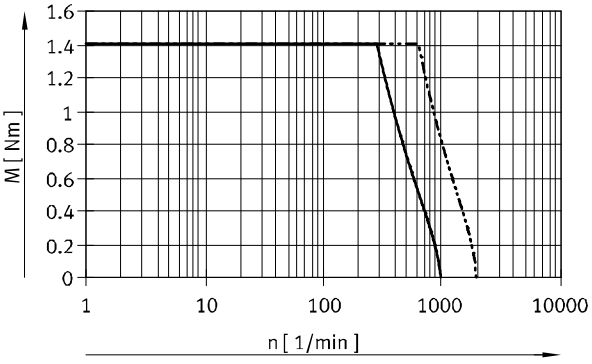
EMMS-ST-42



EMMS-ST-57-S



EMMS-ST-57-M



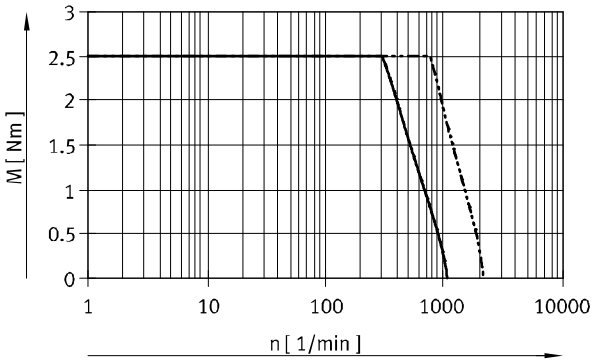
24 V DC
48 V DC

Note

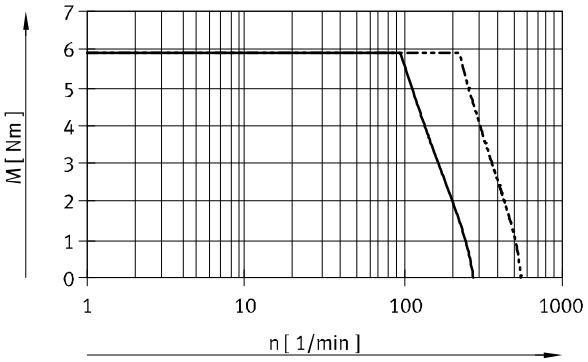
Typical motor characteristics (typical production tolerances ±20%) at nominal voltage and with suitable motor controller.

Torque M as a function of rotational speed n

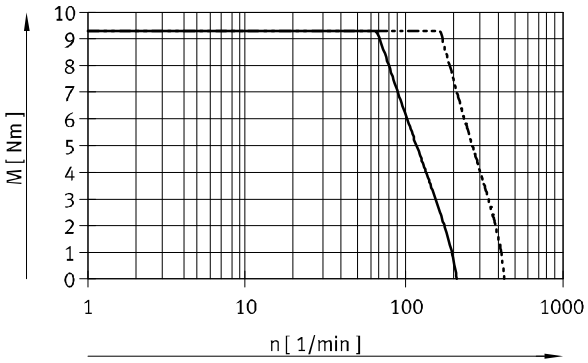
EMMS-ST-87-S



EMMS-ST-87-M



EMMS-ST-87-L



24 V DC
48 V DC

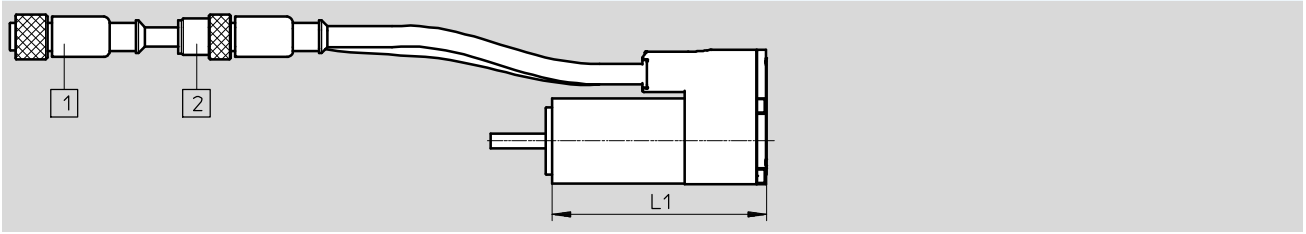
Note

Typical motor characteristics (typical production tolerances ±20%) at nominal voltage and with suitable motor controller.

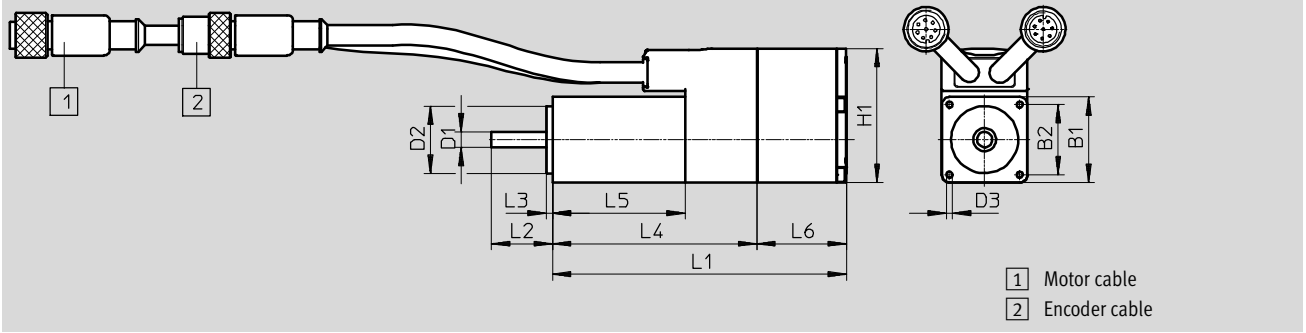
Dimensions Download CAD data ➔ **www.festo.com**

Size 28

EMMS-ST-...-S/SE



EMMS-ST-...-SB/SEB



Type	B1 ±1	B2 ±0.2	D1 ∅ −0.013	D2 ∅ −0.03	D3	H1
EMMS-ST-28-L-S	28	23	5	22	M2.5x4.5	44
EMMS-ST-28-L-SE						
EMMS-ST-28-L-SB						
EMMS-ST-28-L-SEB						

Type	L1	L2 ±1	L3	L4 ±1	L5 ±1	L6 ±0.5
EMMS-ST-28-L-S	70±1	20	2	67	43	29
EMMS-ST-28-L-SE						
EMMS-ST-28-L-SB	96±1.5					
EMMS-ST-28-L-SEB						

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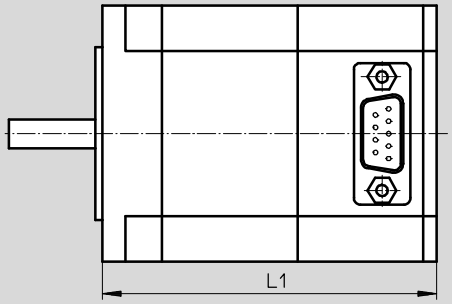
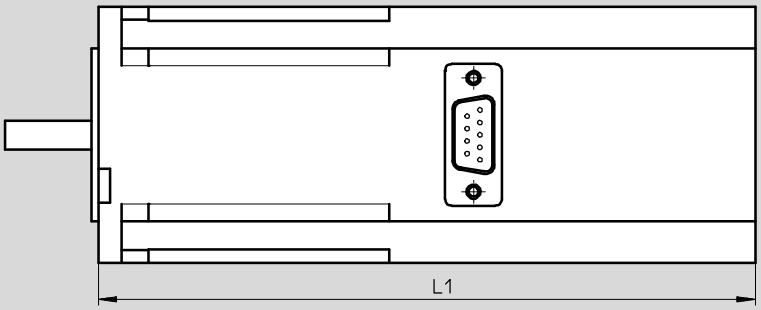
Sizes 42, 57, 87

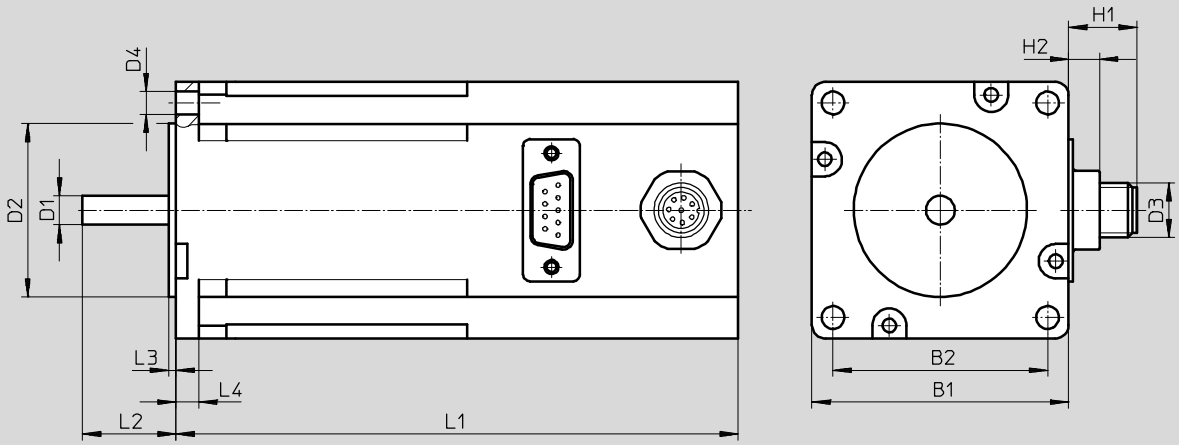
EMMS-ST-...-S



EMMS-ST-...-SB

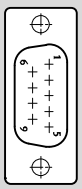


EMMS-ST-...-SE/SEB

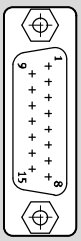


Plug pattern

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



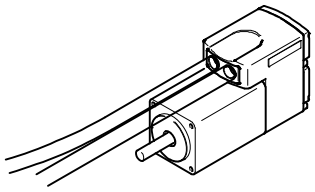
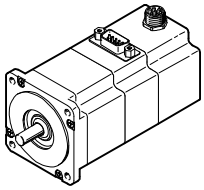
15-pin Sub-D plug
with size 87



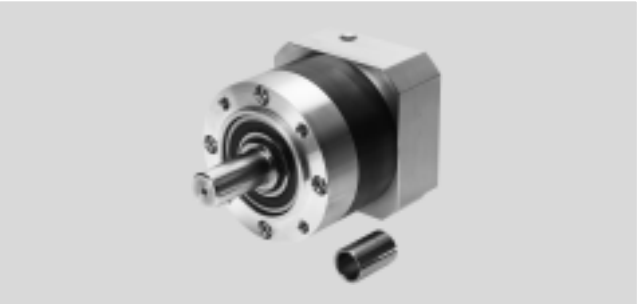
Type	B1	B2 ±0.2	D1 ∅	D2 ∅	D3	D4 ∅
EMMS-ST-42-S-S-G2	42.3	31	5$_{-0.012}$	22$_{-0.05}$	–	M3x4.5
EMMS-ST-42-S-SE-G2					M12	
EMMS-ST-42-S-SB-G2					–	
EMMS-ST-42-S-SEB-G2					M12	
EMMS-ST-57-S-S-G2	56.4	47.14	6.35$_{-0.013}$	38.1$_{\pm 0.025}$	–	5
EMMS-ST-57-S-SE-G2					M12	
EMMS-ST-57-S-SB-G2					–	
EMMS-ST-57-S-SEB-G2					M12	
EMMS-ST-57-M-S-G2					–	
EMMS-ST-57-M-SE-G2					M12	
EMMS-ST-57-M-SB-G2					–	
EMMS-ST-57-M-SEB-G2					M12	
EMMS-ST-87-S-S-G2	85.85	69.5	11$_{-0.013}$	73$_{-0.046}$	–	6.6
EMMS-ST-87-S-SE-G2					M12	
EMMS-ST-87-S-SB-G2					–	
EMMS-ST-87-S-SEB-G2					M12	
EMMS-ST-87-M-S-G2					–	
EMMS-ST-87-M-SE-G2					M12	
EMMS-ST-87-M-SB-G2					–	
EMMS-ST-87-M-SEB-G2					M12	
EMMS-ST-87-L-S-G2					–	
EMMS-ST-87-L-SE-G2					M12	
EMMS-ST-87-L-SB-G2					–	
EMMS-ST-87-L-SEB-G2					M12	

Type	H1	H2	L1	L2	L3	L4
EMMS-ST-42-S-S-G2	–	6.5	66$_{\pm 1}$	24$_{\pm 1}$	2	–
EMMS-ST-42-S-SE-G2	13		94$_{\pm 1.2}$			
EMMS-ST-42-S-SB-G2	–		114$_{\pm 1.3}$			
EMMS-ST-42-S-SEB-G2	13		127$_{\pm 1.3}$			
EMMS-ST-57-S-S-G2	–		73.5$_{\pm 0.8}$	20.6$_{\pm 0.5}$	1.6	5
EMMS-ST-57-S-SE-G2	13		102.5$_{\pm 1.1}$			
EMMS-ST-57-S-SB-G2	–		123.5$_{\pm 1.1}$			
EMMS-ST-57-S-SEB-G2	13		138$_{\pm 1.1}$			
EMMS-ST-57-M-S-G2	–		95$_{\pm 0.8}$			
EMMS-ST-57-M-SE-G2	13		124$_{\pm 1.1}$			
EMMS-ST-57-M-SB-G2	–		145$_{\pm 1.1}$			
EMMS-ST-57-M-SEB-G2	13		159.5$_{\pm 1.1}$			
EMMS-ST-87-S-S-G2	–		82.6$_{\pm 1}$	27$_{\pm 1}$	2	8.38
EMMS-ST-87-S-SE-G2	13		112.6$_{\pm 1.3}$			
EMMS-ST-87-S-SB-G2	–		132.6$_{\pm 1.3}$			
EMMS-ST-87-S-SEB-G2	13		152.6$_{\pm 1.3}$			
EMMS-ST-87-M-S-G2	–		114.9$_{\pm 1}$			
EMMS-ST-87-M-SE-G2	13		144.9$_{\pm 1.3}$			
EMMS-ST-87-M-SB-G2	–		164.9$_{\pm 1.3}$			
EMMS-ST-87-M-SEB-G2	13		184.9$_{\pm \text{☒} \geq 3}$			
EMMS-ST-87-L-S-G2	–		144.9$_{\pm 1}$			
EMMS-ST-87-L-SE-G2	13		174.9$_{\pm 1.3}$			
EMMS-ST-87-L-SB-G2	–		194.9$_{\pm 1.3}$			
EMMS-ST-87-L-SEB-G2	13		214.9$_{\pm 1.3}$			

Ordering data

	Size	Variant			Part No.	Type
		Basic design	With encoder	With brake		
	28	■			**1451384**	**EMMS-ST-28-L-S**
			■		**1430663**	**EMMS-ST-28-L-SE**
				■	**1451383**	**EMMS-ST-28-L-SB**
			■	■	**1451382**	**EMMS-ST-28-L-SEB**
	42	■			**1370470**	**EMMS-ST-42-S-S-G2**
			■		**1370471**	**EMMS-ST-42-S-SE-G2**
				■	**1370472**	**EMMS-ST-42-S-SB-G2**
			■	■	**1370473**	**EMMS-ST-42-S-SEB-G2**
	57	■			**1370474**	**EMMS-ST-57-S-S-G2**
			■		**1370475**	**EMMS-ST-57-S-SE-G2**
				■	**1370476**	**EMMS-ST-57-S-SB-G2**
			■	■	**1370477**	**EMMS-ST-57-S-SEB-G2**
		■			**1370478**	**EMMS-ST-57-M-S-G2**
			■		**1370479**	**EMMS-ST-57-M-SE-G2**
				■	**1370480**	**EMMS-ST-57-M-SB-G2**
			■	■	**1370481**	**EMMS-ST-57-M-SEB-G2**
	87	■			**1370482**	**EMMS-ST-87-S-S-G2**
			■		**1370483**	**EMMS-ST-87-S-SE-G2**
				■	**1370484**	**EMMS-ST-87-S-SB-G2**
			■	■	**1370485**	**EMMS-ST-87-S-SEB-G2**
		■			**1370486**	**EMMS-ST-87-M-S-G2**
			■		**1370487**	**EMMS-ST-87-M-SE-G2**
				■	**1370488**	**EMMS-ST-87-M-SB-G2**
			■	■	**1370489**	**EMMS-ST-87-M-SEB-G2**
		■			**1370490**	**EMMS-ST-87-L-S-G2**
			■		**1370491**	**EMMS-ST-87-L-SE-G2**
				■	**1370493**	**EMMS-ST-87-L-SB-G2**
			■	■	**1370494**	**EMMS-ST-87-L-SEB-G2**

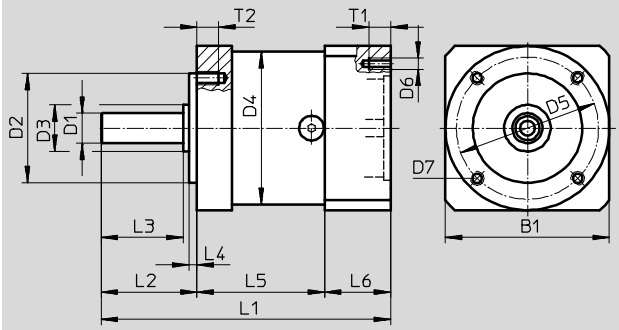
Gear unit EMGA



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 ratio	[i]	3	5	3	5	3	5
Continuous output torque[1]	[Nm]	11	14	22	22	85	110
Max. output torque	[Nm]	17.6	22	35.2	35.2	136	176
Torsional rigidity	[Nm/arcmin]	1		2.3		6	
Torsional backlash	[deg]	0.25		0.17		0.12	
Moment of inertia[2]	[kgcm^2]	0.031	0.019	0.135	0.078	0.77	0.45
Efficiency	[%]	98					
Operating temperature[3]	[°C]	–25 ... +90					
Protection class		IP54					

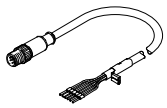
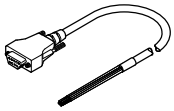
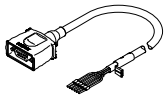
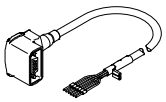
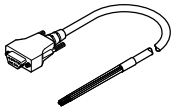
1) At the output shaft
2) In relation to the drive shaft
3) Note the temperature range of the motor

Dimensions Download CAD data ➔ **www.festo.com**

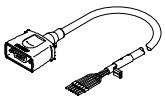
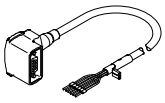
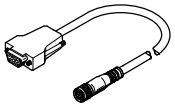
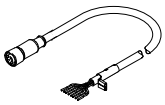
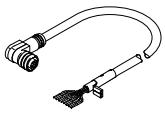


For size	B1	D1 ∅ h7	D2 ∅ h7	D3 ∅	D4 ∅	D5 ∅	D6	D7	L1 ±1.5	L2	L3 ±0.2	L4 ±0.2	L5	L6	T1	T2
42	40	10	26	12	40	34	∅3.4	M4	92.5	26±0.6	23	2	39	27.5	5	6
57	60	11	40	17	60	52	M4	M5	106	35±0.8	30	3	47	24	8	8
87	90	20	60	25	80	70	M5	M6	135.5	40±0.8	36	3	60	35.5	12	10

Ordering data			
For size	Gear ratio	Part No.	Type
42	3	**549428**	**EMGA-40-P-G3-SST-42**
	5	**549429**	**EMGA-40-P-G5-SST-42**
57	3	**549430**	**EMGA-60-P-G3-SST-57**
	5	**549431**	**EMGA-60-P-G5-SST-57**
87	3	**549432**	**EMGA-80-P-G3-SST-87**
	5	**549433**	**EMGA-80-P-G5-SST-87**

Ordering data				
	Description	Cable length [m]	Part No.	Type
Motor cable				
For EMMS-ST-28				
and motor controller CMMO-ST				
	Straight plug			
	– Min. bending radius: 62 mm	1.5	**1449600**	**NEBM-M12G8-E-1.5-Q5-LE6**
	– Suitable for use with energy chains	2.5	**1449601**	**NEBM-M12G8-E-2.5-Q5-LE6**
	– Ambient temperature:	5.0	**1449602**	**NEBM-M12G8-E-5-Q5-LE6**
	–40 … +80 °C	7.0	**1449603**	**NEBM-M12G8-E-7-Q5-LE6**
		10.0	**1449604**	**NEBM-M12G8-E-10-Q5-LE6**
		X length [1]	**1449605**	**NEBM-M12G8-E-…-Q5-LE6**
For EMMS-ST-42/57				
and motor controller CMMS-ST				
	Straight plug			
	– Min. bending radius: 58 mm	5.0	**550740**	**NEBM-S1G9-E-5-LE6**
	– Suitable for use with energy chains	10.0	**550741**	**NEBM-S1G9-E-10-LE6**
	– Ambient temperature:	15.0	**550742**	**NEBM-S1G9-E-15-LE6**
	–40 … +70 °C	X length [1]	**550743**	**NEBM-S1G9-E-…-LE6**
and motor controller CMMO-ST				
	Straight plug			
	– Min. bending radius: 62 mm	1.5	**1450368**	**NEBM-S1G9-E-1.5-Q5-LE6**
	– Suitable for use with energy chains	2.5	**1450369**	**NEBM-S1G9-E-2.5-Q5-LE6**
	– Ambient temperature:	5.0	**1450370**	**NEBM-S1G9-E-5-Q5-LE6**
	–40 … +80 °C	7.0	**1450371**	**NEBM-S1G9-E-7-Q5-LE6**
		10.0	**1450372**	**NEBM-S1G9-E-10-Q5-LE6**
		X length [1]	**1450373**	**NEBM-S1G9-E-…-Q5-LE6**
	Angled plug			
	– Min. bending radius: 62 mm	1.5	**1450736**	**NEBM-S1W9-E-1.5-Q5-LE6**
	– Suitable for use with energy chains	2.5	**1450737**	**NEBM-S1W9-E-2.5-Q5-LE6**
	– Ambient temperature:	5.0	**1450738**	**NEBM-S1W9-E-5-Q5-LE6**
	–40 … +80 °C	7.0	**1450739**	**NEBM-S1W9-E-7-Q5-LE6**
		10.0	**1450740**	**NEBM-S1W9-E-10-Q5-LE6**
		X length [1]	**1450741**	**NEBM-S1W9-E-…-Q5-LE6**
For EMMS-ST-87				
and motor controller CMMS-ST				
	Straight plug			
	– Min. bending radius: 70 mm	5.0	**550744**	**NEBM-S1G15-E-5-LE6**
	– Suitable for use with energy chains	10.0	**550745**	**NEBM-S1G15-E-10-LE6**
	– Ambient temperature:	15.0	**550746**	**NEBM-S1G15-E-15-LE6**
	–30 … +70 °C	X length [1]	**550747**	**NEBM-S1G15-E-…-LE6**

1) Max. 25 m. Available in 0.1 m increments.

Ordering data				
	Description	Cable length [m]	Part No.	Type
Motor cable				
For EMMS-ST-87				
and motor controller CMMO-ST				
	Straight plug			
	– Min. bending radius: 80 mm	1.5	**1450834**	**NEBM-S1G15-E-1.5-Q7-LE6**
	– Suitable for use with energy chains	2.5	**1450835**	**NEBM-S1G15-E-2.5-Q7-LE6**
	– Ambient temperature:	5.0	**1450836**	**NEBM-S1G15-E-5-Q7-LE6**
	–40 … +80 °C	7.0	**1450837**	**NEBM-S1G15-E-7-Q7-LE6**
		10.0	**1450838**	**NEBM-S1G15-E-10-Q7-LE6**
		X length [1]	**1450839**	**NEBM-S1G15-E-…-Q7-LE6**
	Angled plug			
	– Min. bending radius: 80 mm	1.5	**1450943**	**NEBM-S1W15-E-1.5-Q7-LE6**
	– Suitable for use with energy chains	2.5	**1450944**	**NEBM-S1W15-E-2.5-Q7-LE6**
	– Ambient temperature:	5.0	**1450945**	**NEBM-S1W15-E-5-Q7-LE6**
	–40 … +80 °C	7.0	**1450946**	**NEBM-S1W15-E-7-Q7-LE6**
		10.0	**1450947**	**NEBM-S1W15-E-10-Q7-LE6**
		X length [1]	**1450948**	**NEBM-S1W15-E-…-Q7-LE6**
Encoder cable				
For motor controller CMMS-ST				
	Straight plug			
	– Min. bending radius: 51 mm	5.0	**550748**	**NEBM-M12G8-E-5-S1G9**
	– Suitable for use with energy chains	10.0	**550749**	**NEBM-M12G8-E-10-S1G9**
	– Ambient temperature:	15.0	**550750**	**NEBM-M12G8-E-15-S1G9**
	–40 … +70 °C	X length [1]	**550751**	**NEBM-M12G8-E-…-S1G9**
For motor controller CMMO-ST				
	Straight plug			
	– Min. bending radius: 68 mm	1.5	**1451586**	**NEBM-M12G8-E-1.5-LE8**
	– Suitable for use with energy chains	2.5	**1451587**	**NEBM-M12G8-E-2.5-LE8**
	– Ambient temperature:	5.0	**1451588**	**NEBM-M12G8-E-5-LE8**
	–40 … +80 °C	7.0	**1451589**	**NEBM-M12G8-E-7-LE8**
		10.0	**1451590**	**NEBM-M12G8-E-10-LE8**
		X length [1]	**1451591**	**NEBM-M12G8-E-…-LE8**
	Angled plug			
	– Min. bending radius: 68 mm	1.5	**1451674**	**NEBM-M12W8-E-1.5-LE8**
	– Suitable for use with energy chains	2.5	**1451675**	**NEBM-M12W8-E-2.5-LE8**
	– Ambient temperature:	5.0	**1451676**	**NEBM-M12W8-E-5-LE8**
	–40 … +80 °C	7.0	**1451677**	**NEBM-M12W8-E-7-LE8**
		10.0	**1451678**	**NEBM-M12W8-E-10-LE8**
		X length [1]	**1451679**	**NEBM-M12W8-E-…-LE8**

1) Max. 25 m. Available in 0.1 m increments.