

Winding types

[dots] -216P -213P -216E -213E -210E -208E

Measured values

1 Measuring voltage	V	4.5	6.0	9.0	12.0	15.0	24.0
2 No-load speed	rpm	6400	7100	6700	7600	7500	6300
3 Stall torque	mNm (oz-in)	18.2 (2.59)	16.0 (2.27)	17.1 (2.42)	15.0 (2.13)	11.5 (1.63)	11.5 (1.62)
4 Average no-load current	mA	18	15	9	7.6	6.0	3.2
5 Typical starting voltage	V	0.06	0.08	0.10	0.15	0.15	0.20

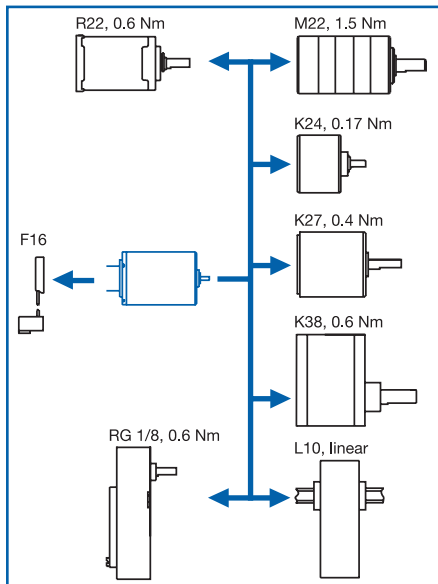
Max. recommended values

6 Max. continuous current	A	1.55	1.15	0.77	0.58	0.40	0.23
7 Max. continuous torque	mNm (oz-in)	10.27(1.45)	9.09 (1.29)	9.66 (1.37)	8.48 (1.20)	7.4 (1.05)	8.13 (1.15)
8 Max. angular acceleration	10 ³ rad/s ²	66	71	62	66	64	85

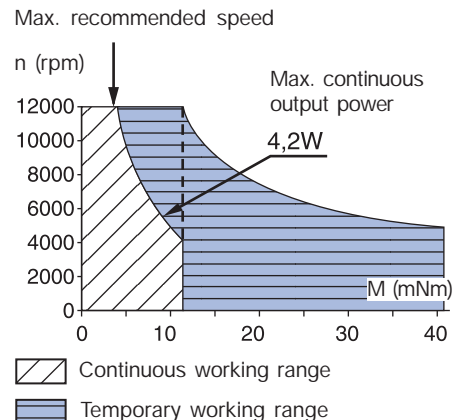
Intrinsic parameters

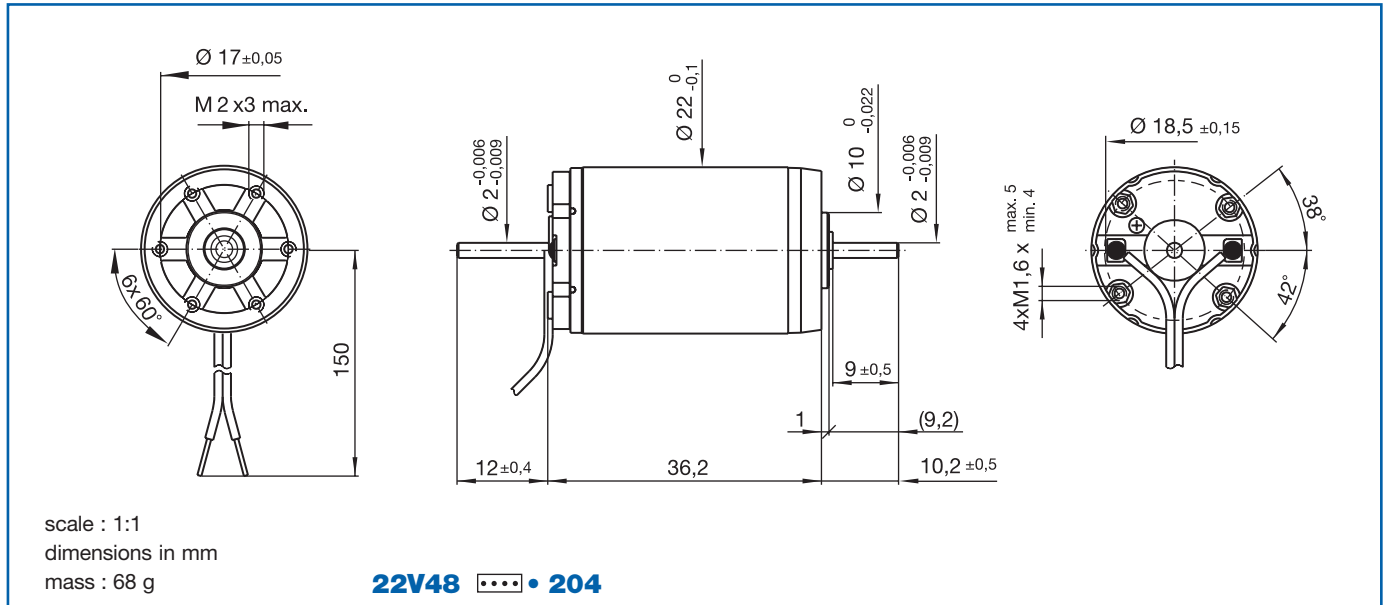
9 Back-EMF constant	V/1000 rpm	0.70	0.84	1.33	1.56	1.97	3.75
10 Torque constant	mNm/A (oz-in/A)	6.7 (0.95)	8.0 (1.13)	12.7 (1.80)	14.9 (2.11)	18.8 (2.66)	35.8 (5.07)
11 Terminal resistance	ohm	1.65	3.00	6.70	11.9	24.5	75.0
12 Motor regulation R/k ²	10 ³ /Nms	37	47	42	54	69	58
13 Rotor inductance	mH	0.10	0.15	0.50	0.55	0.80	3.30
14 Rotor inertia	kgm ² · 10 ⁻⁷	3.90	3.20	3.90	3.20	2.90	2.40
15 Mechanical time constant	ms	14	15	16	17	20	14

Availability: see enclosed document at the end of the catalogue



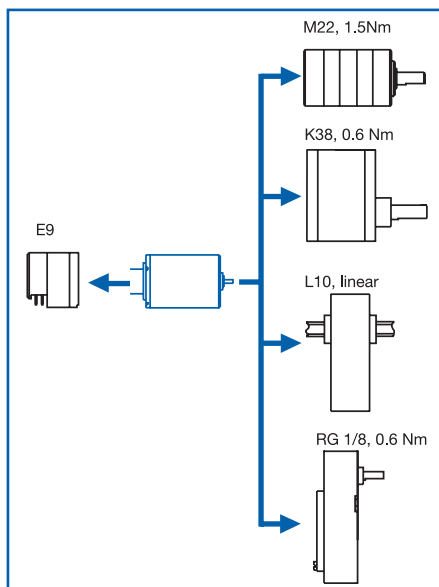
- Thermal resistance :
rotor-body 6 °C/W
body-ambient 20 °C/W
- Thermal time constant - rotor / stator :
10 s / 460 s
- Max. rated coil temperature : 100°C (210°F)
- Recom. ambient temperature range :
-30 °C to +65 °C (-22 °F to +150 °F)
- Viscous damping constant :
0.05 x 10⁻⁶ Nms
- Max. axial static force for press-fit : 150 N
- End play :
Radial play : ≤ 30 µm
Shaft runout : ≤ 10 µm
- Max. side load at 5 mm from mounting face
- sleeve bearings 3 N
- ball bearings 6 N
- Motor fitted with sleeve bearings
(ball bearings optional)



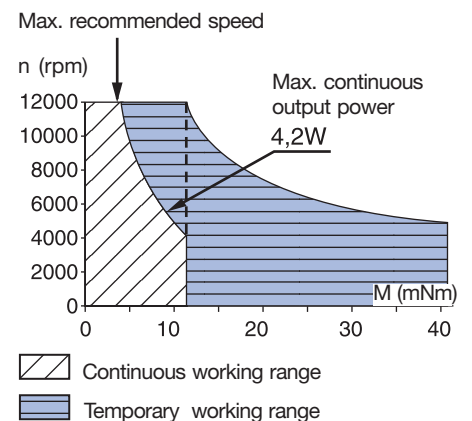


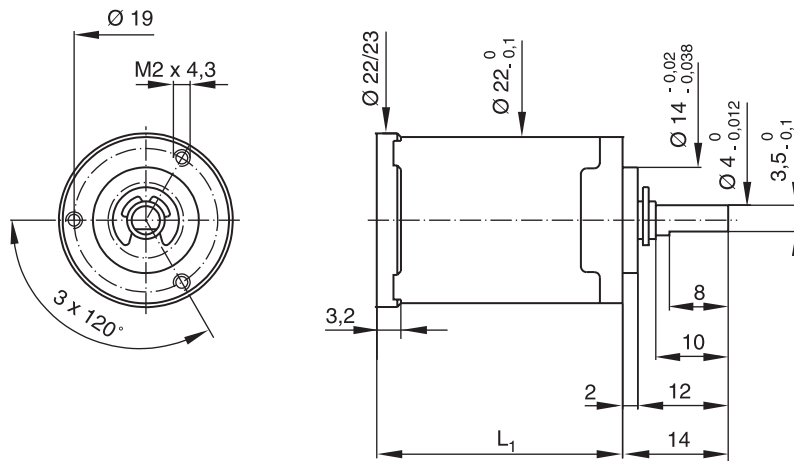
Winding types	...	-216P	-213P	-216E	-213E	-210E	-208E
Measured values							
1 Measuring voltage	V	4.5	6.0	9.0	12.0	15.0	24.0
2 No-load speed	rpm	6400	7100	6700	7600	7500	6300
3 Stall torque	mNm (oz-in)	18.2 (2.59)	16.0 (2.27)	17.1 (2.42)	15.0 (2.13)	11.5 (1.63)	11.5 (1.62)
4 Average no-load current	mA	27	22	13.5	11	9	4.8
5 Typical starting voltage	V	0.06	0.08	0.10	0.15	0.15	0.20
Max. recommended values							
6 Max. continuous current	A	1.55	1.15	0.77	0.58	0.40	0.23
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12 Motor regulation R/k ²	10 ³ /Nms	37	47	42	54	69	58
13 Rotor inductance	mH	0.10	0.15	0.50	0.55	0.80	3.30
14 Rotor inertia	kgm ² · 10 ⁻⁷	3.90	3.20	3.90	3.20	2.90	2.40
15 Mechanical time constant	ms	14	15	16	17	20	14

Availability: see enclosed document at the end of the catalogue



- Thermal resistance :
rotor-body 6 °C/W
body-ambient 20 °C/W
- Thermal time constant - rotor / stator :
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- Recom. ambient temperature range :
-30 °C to +65 °C (-22 °F to +150 °F)
- Viscous damping constant :
0.05 x 10⁻⁶ Nms
- Max. axial static force for press-fit : 150 N
- End play : ≤ 150 µm
Radial play : ≤ 30 µm
Shaft runout : ≤ 10 µm
- Max. side load at 5 mm from mounting face
- sleeve bearings 3 N
- ball bearings 6 N
- Motor fitted with sleeve bearings
(ball bearings optional)





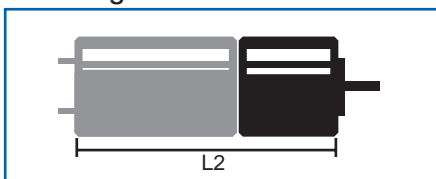
scale 1:1
dimensions in mm

R22 • 0 [dots]

Ratio [dots] **5.75 16.2 19.4 27.6 33.1 65.5 93.2 111 132 159 190 376 641 1090**

	5.75	16.2	19.4	27.6	33.1	65.5	93.2	111	132	159	190	376	641	1090
1 No. of gear stages	1	2	2	2	2	3	3	3	3	3	3	4	4	4
2 Dir. of rotation	=	=	=	=	=	=	=	=	=	=	=	=	=	=
3 Efficiency	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5
4 L1 (mm)	25	32.5	32.5	32.5	32.5	40	40	40	40	40	40	40	40	40
5 Mass (g)	20	25	25	25	25	30	30	30	30	30	30	33	33	33
6 Available with motor	L2- length with motor (mm)													
22S28 • 1	48.8	56.3	56.3	56.3	56.3	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8
22N28 • 201	54.8	62.3	62.3	62.3	62.3	69.8	69.8	69.8	69.8	69.8	69.8	69.8	69.8	69.8
22V28 • 202	59.4	66.9	66.9	66.9	66.9	74.4	74.4	74.4	74.4	74.4	74.4	74.4	74.4	74.4
23LT12 • 45	62.1	69.6	69.6	69.6	69.6	77.1	77.1	77.1	77.1	77.1	77.1	77.1	77.1	77.1
23V58 • 4	73.8	81.3	81.3	81.3	81.3	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8
23DT12 • 38	75.5	83	83	83	83	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5
26N 28 • 5 / •9	68.3	75.8	75.8	75.8	75.8	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
28L28 • 164	68.5	76	76	76	76	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5
28LT12 • 164	68.2	75.7	75.7	75.7	75.7	83.2	83.2	83.2	83.2	83.2	83.2	83.2	83.2	83.2
P310 • 09	46.7	54.2	54.2	54.2	54.2	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.7

Motor + gearbox = L2



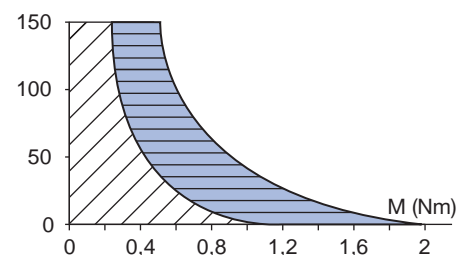
Availability: see enclosed document at the end of the catalogue

Characteristics

R22 • 0 **R22 2R • 0**

		R22 • 0	R22 2R • 0
7 Bearing type		sleeve bearings	ball bearings
8 Max. static torque	Nm (oz-in)	2 (283)	2 (283)
9 Max. radial force at 8 mm from mounting face	N (lb)	10 (2.2)	15 (3.3)
10 Max. axial force	N (lb)	10 (2.2)	10 (2.2)
11 Force for press-fit	N (lb)	300 (67.4)	300 (67.4)
12 Average backlash at no-load		1.5°	1.5°
13 Average backlash at 0,3 Nm		3°	3°
14 Radial play	µm	≤ 25	≤ 10
15 Axial play	µm	50 -150	50 -150
16 Max. recom. input speed	rpm	5000	5000
17 Operating temperature range	°C (°F)	-30 ... +65 (-22...+150)	

n (rpm) Dynamic torque



Values at the output shaft

▨ Continuous working range
■ Temporary working range