

Solenoids

Rotary Solenoids

Ultimag® Series



BTA® Series Brushless Torque



Type	4EM	5EM	6EM	2EVM	3EVM
Dimensions (mm)	∅ 41 x 26	∅ 49 x 31	∅ 59 x 41	∅ 30 x 18	∅ 35 x 23
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement	Quiet, shock-free operation; true rotary motion with no axial displacement	Quiet, shock-free operation; true rotary motion with no axial displacement	Quiet, shock-free operation; true rotary motion with no axial displacement	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	Field proven over 100 million cycles	100 M cycles	100 M cycles	100 M cycles	100 M cycles
Power (W)	14.5–145	42–210	32–320	20–100	13–130
Supply (V)	3.2–115 VDC	6.6–168 VDC	9.2–313 VDC	3.1–80 VDC	1.9–78.7 VDC
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Rotary Solenoids

BTA® Series Brushless Torque



Rotary Solenoids



Type	4EVM	5EVM	6EVM	1E	2E
Dimensions (mm)	∅ 41 x 27	∅ 49 x 32	∅ 59 x 41	∅ 25 x 16	∅ 29 x 17
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement	Quiet, shock-free operation; true rotary motion with no axial displacement	Quiet, shock-free operation; true rotary motion with no axial displacement	"Snap" acting engagement; some axial displacement necessary	"Snap" acting engagement; some axial displacement necessary
Life	Field proven over 100 million cycles	100 M cycles	100 M cycles	1 million cycles	1 million cycles
Power (W)	14.5–145	21–210	32–320	10.5–108	7–140
Supply (V)	3.2–115 VDC	4.7–168 VDC	9.2–313 VDC	2.9–94 VDC	2.2–128 VDC
Page	34	37	40	46	49

Rotary Solenoids

Rotary Solenoids



Type	3B	3E	4E	5B	5S
Dimensions (mm)	∅ 33 x 22	∅ 33 x 20	∅ 40 x 24	∅ 48 x 26	∅ 48 x 27
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Operation	clockwise or anti clockwise	clockwise or anti clockwise	clockwise or anti clockwise	clockwise or anti clockwise	clockwise or anti clockwise
Life	1 million cycles	1 million cycles	1 million cycles	1 million cycles	1 million cycles
Power (W)	10–200	9–180	12.5–250	21–420	21–420
Supply (V)	2.6–123 VDC	2.6–118 VDC	4.3–187 VDC	6.1–273 VDC	6.1–271 VDC
Page	52	55	58	61	64

Rotary Solenoids

Rotary Solenoids



Type	6S	7S
Dimensions (mm)	∅ 57 x 34	∅ 70 x 45
Duty cycle	continuous or intermittent	continuous or intermittent
Operation	clockwise or anti clockwise	clockwise or anti clockwise
Life	1 million cycles	1 million cycles
Power (W)	32–640	35–700
Supply (V)	10.3–469 VDC	16.3–463 VDC
Page	67	70

Linear Solenoids

Soft Shift®



Type	2EPM	3EPM	4EPM	5EPM	6EPM
Dimensions (mm)	Ø 29 x 25	Ø 33 x 31	Ø 40 x 37	Ø 48 x 49	Ø 48 x 49
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Operation	Quiet operation with 3-5 times the starting force of standard solenoids	Quiet operation with 3-5 times the starting force of standard solenoids	Quiet operation with 3-5 times the starting force of standard solenoids	Quiet operation with 3-5 times the starting force of standard solenoids	Quiet operation with 3-5 times the starting force of standard solenoids
Life	1 million cycles	1 million cycles	1 million cycles	1 million cycles	1 million cycles
Power (W)	7-70	9-90	12,5-125	21-210	32-320
Supply (V)	2,2-91 VDC	2,6-83 VDC	4,3-132 VDC	7,2-226 VDC	12,3-394 VDC
Page	76	79	82	85	88

Linear Solenoids

Tubular



Type	STA Pull 13 x 27	STA Push 13 x 27	STA Pull 20 x 39	STA Push 20 x 39	STA Pull 26 x 52
Dimensions (mm)	Ø 13 x 27	Ø 13 x 27	Ø 20 x 39	Ø 20 x 39	Ø 26 x 52
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Operation	Pull engagement; well-suited to lock/latch operations	Push engagement; well-suited to lock/latch operations	Pull engagement; well-suited to lock/latch operations	Push engagement; well-suited to lock/latch operations	Pull engagement; well-suited to lock/latch operations
Life	Extraordinary life of 25+ million actuations	Extraordinary life of 25+ million actuations	25 M cycles	25 M cycles	25 M cycles
Power (W)	4-40	4-40	7-70	7-70	10-100
Supply (V)	2,4-77 VDC	2,4-77 VDC	3,9-76 VDC	3,9-76 VDC	4,4-142 VDC
Page	94	97	100	103	106

Linear Solenoids

Tubular



Low Profile



Type	STA Push 26 x 52	STA 125M Pull	STA 150M Pull	0ECM	1ECM
Dimensions (mm)	∅ 26 x 52	∅ 32 x 57	∅ 38 x 63	∅ 19 x 13	∅ 25 x 14
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Operation	Push engagement; well-suited to lock/latch operations	Pull	Pull	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs
Life	25 M cycles	1 million cycles	1 million cycles	5 M cycles	5 M cycles
Power (W)	10–100	13–130	17–170	4,5–45	5–50
Supply (V)	4,4–142 VDC	6,8–218 VDC	9,8–315 VDC	1,6–78 VDC	2,1–83 VDC
Page	109	112	115	120	123

Linear Solenoids

Low Profile



Type	2EFM	2ECM	3EFM	3ECM	4EFM
Dimensions (mm)	∅ 29 x 15	∅ 29 x 15	∅ 33 x 18	∅ 33 x 18	∅ 40 x 21
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Operation	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs
Life	5 M cycles	5 M cycles	5 M cycles	5 M cycles	5 M cycles
Power (W)	7–70	7–70	9–90	9–90	12,5–125
Supply (V)	2,2–56 VDC	2,2–56 VDC	2,6–83 VDC	2,6–83 VDC	4,3–132 VDC
Page	126	129	132	135	138

Linear Solenoids

Low Profile



Type	4ECM	5SFM	5ECM	6SFM	6ECM
Dimensions (mm)	∅ 40 x 21	∅ 48 x 22	∅ 48 x 26	∅ 57 x 29	∅ 57 x 34
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Operation	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs	Push or pull operations Pull use: Opposite of mounting pegs
Life	5 M cycles	5 M cycles	5 M cycles	5 M cycles	1 million cycles
Power (W)	12,5–125	21–210	21–210	32–320	32–320
Supply (V)	4,3–132 VDC	6,1–192 VDC	7,2–226 VDC	10,3–331 VDC	12,3–394 VDC
Page	141	144	147	150	153

Linear Solenoids

Open Frame, DC Operation



Type	B-75M	B-4HDM	B-11M	B-16M	B-17M
Dimensions (mm)	29 x 28 x 41,5	41 x 37 x 55	30 x 24 x 47	13 x 10 x 34	13 x 15 x 24
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Nominal Stroke	12 mm	25,4 mm	20,3 mm	3,8 mm	4,6 mm
Operation	DC	DC	DC	DC	DC
Typical Force (N)	12 N (@5% Duty Cycle / 230 VAC/11 mm stroke)	15,6 N (@25% Duty Cycle / 100% Voltage maximum stroke)	4,4 N (@25% Duty Cycle / 100% Voltage maximum stroke)	4,1 N (@25% Duty Cycle / 100% Voltage maximum stroke)	2,1 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	100 000 cycles	1 Mio cycles	1 Mio cycles	1 Mio cycles	1 Mio cycles
Page	158	161	164	167	170

Linear Solenoids

Open Frame, DC Operation



Type	B-22M	B-41M
Dimensions (mm)	37 x 33 x 41	44 x 51,5 x 77,5
Duty cycle	continuous or intermittent	continuous or intermittent
Nominal Stroke	25,4 mm	25,4 mm
Operation	DC	DC
Typical Force (N)	9,8 N (@25% Duty Cycle / 100% Voltage maximum stroke)	44,5 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles	1 Mio cycles
Page	173	176

Linear Solenoids

Open Frame, DC Operation



Type	C-8M	C-9M	C-15M	C-26M	C-33M
Dimensions (mm)	21 x 19 x 29	41 x 35 x 27	28 x 27 x 29	29 x 22 x 44	29 x 33 x 34
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Nominal Stroke	12,7 mm	12,7 mm	12,7 mm	19 mm	12,7 mm
Operation	DC	DC	DC	DC	DC
Typical Force (N)	1,1 N (@25% Duty Cycle / 100% Voltage maximum stroke)	4,4 N (@25% Duty Cycle / 100% Voltage maximum stroke)	2,7 N (@25% Duty Cycle / 100% Voltage maximum stroke)	2,2 N (@25% Duty Cycle / 100% Voltage maximum stroke)	4,9 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles	1 Mio cycles	1 Mio cycles	1 Mio cycles	1 Mio cycles
Page	179	182	185	188	191

Linear Solenoids

Open Frame, DC Operation



Type	C-34M
Dimensions (mm)	37 x 33 x 42
Duty cycle	continuous or intermittent
Nominal Stroke	25,4 mm
Operation	DC
Typical Force (N)	4,4 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Page	194

Linear Solenoids

Open Frame, AC Operation



Type	B-75M	B-4HDM	B-11M	B-22M	C-8M
Dimensions (mm)	28 x 29 x 41,5	41 x 37 x 55	30 x 24 x 47	37 x 33 x 41	21 x 19 x 29
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Nominal Stroke	12 mm	25,4 mm	25,4 mm	25,4 mm	12,7 mm
Operation	AC	AC	AC	AC	AC
Typical Force (N)	12 N (@5% Duty Cycle / 230 VAC/11 mm stroke)	22,2 N (@25% Duty Cycle / 100% Voltage maximum stroke)	5,8 N (@25% Duty Cycle / 100% Voltage maximum stroke)	11,6 N (@25% Duty Cycle / 100% Voltage maximum stroke)	1,8 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	100 000 cycles	1 Mio cycles	1 Mio cycles	1 Mio cycles	1 Mio cycles
Page	200	203	206	209	212


Linear Solenoids

Open Frame, AC Operation



Type	C-9M	C-15M	C-26M	C-33M	C-34M
Dimensions (mm)	31 x 35 x 27	25 x 27 x 29	26 x 22 x 44	29 x 33 x 34	37 x 33 x 42
Duty cycle	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent	continuous or intermittent
Nominal Stroke	12,7 mm	12,7 mm	19,0 mm	12,7 mm	25,4 mm
Operation	AC	AC	AC	AC	AC
Typical Force (N)	11,1 N (@25% Duty Cycle / 100% Voltage maximum stroke)	3,6 N (@25% Duty Cycle / 100% Voltage maximum stroke)	3,1 N (@25% Duty Cycle / 100% Voltage maximum stroke)	5,3 N (@25% Duty Cycle / 100% Voltage maximum stroke)	9,3 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles	1 Mio cycles	1 Mio cycles	1 Mio cycles	1 Mio cycles
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Saia-Burgess is active in the development and manufacture of Switches, Sensors, Motors, Solenoides, Control Components as well as related sub-systems.

Ultimag® Series

Ultimag	Type	Preferred Products	Page
	4EM	199172-027	16
	5EM	199173-025	19
	6EM	199174-023	22

4EM

Ultimag® Series Rotary Actuators

Ultimag

4EM

Dimensions (mm)	∅ 41 x 26
Duty cycle	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	Field proven over 100 million cycles
Power (W)	14.5–145
Supply (V)	3.2–115 VDC
Power	Low power consumption; moderate torque output
Functional Advantages	Fast energising time and extremely high speed cycle rates; on/off or proportional mode operation



Technical Data

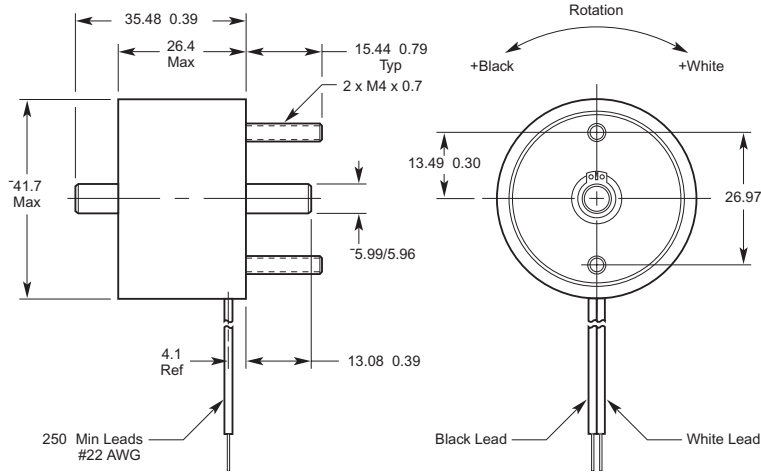
Dielectric Strength	1000 VRMS (23 awg) (wire diameter); 1200 VRMS (24-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimag are based on an unrestricted flow of air at 20°C, with the Ultimag mounted on the equivalent of an aluminium plate measuring 159 x 159 x 3.2 mm
Stroke	+/- 22.5°
Thermal Resistance	7.6° C/watt with heatsink; 15.0° C/watt without heatsink
Rotor Inertia	8.43 x 10 ⁻⁷ (kgm ²)
Peak Torque Rating (Tp)	0.32 Nm
Power Input	145 watts (stalled at Tp; 25°C; Pp)
Number of Phases	1
Static Friction (Tf)	7 mNm
-3dB Closed Loop	78 Hz
Maximum Winding	180° C
Number of Poles	6

Preferred Range

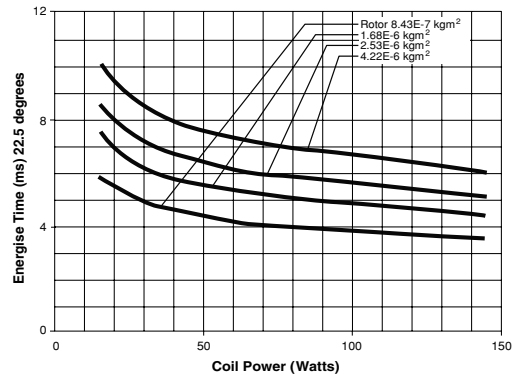
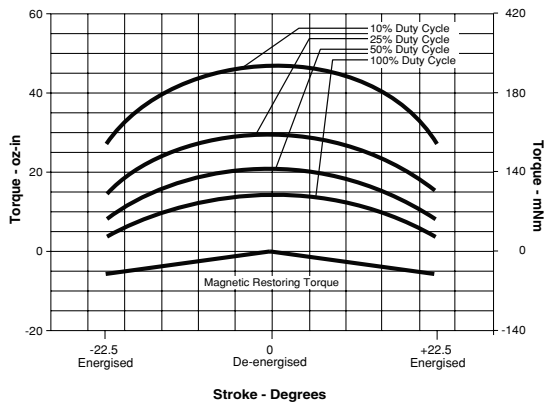
Type	Size	Nominal voltage	Duty Cycle	Nominal power	Net starting torque	max. "On time"
199172-027	∅ 41 X 26 mm	12.9 VDC	50%	29 W @20°C	0.14 Nm	40 sec

4EM

Dimensions



Performance chart



4EM

Ordering Reference

Type 199172-(OXX)

Performance		100%	50%	25%	10%	
Maximum Duty Cycle		∞	40	15	4	
Maximum ON Time when pulsed continuously ¹	sec					
Typical Energise Time	msec ²	6	5	4.5	3.5	
Net Starting Torque	Nm	0.10	0.14	0.21	0.33	
Net Ending Torque	Nm	0.02	0.06	0.10	0.19	
Watts	@ 20°C	14.5	29	58	145	
Ampere Turns	@ 20°C	510	721	1020	1613	
Coil Data		# Turns ⁴	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
awg (OXX) ³	Resistance (@20°C)					
023	0.71	104	3.2	4.5	6.4	10.1
024	1.54	174	4.7	6.7	9.4	14.9
025	2.15	195	5.6	7.9	11.2	17.6
026	3.01	219	6.6	9.3	13.2	20.9
027	5.78	328	9.2	12.9	18.3	28.9
028	8.09	368	10.8	15.3	21.7	34.3
029	14.40	515	14.5	20.4	28.9	45.7
030	20.11	575	18.9	24.2	37.7	59.6
031	34.40	774	22.3	31.6	44.6	71.0
032	56.60	1008	28.7	40.5	57.0	91.0
033	91.40	1288	36.0	51.5	73.0	115.0

¹ Continuously pulsed at stated watts and duty cycle

² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.

³ Other coil awg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

5EM

Ultimag® Series Rotary Actuators

Ultimag

5EM

Dimensions (mm)	∅ 49 x 31
Duty cycle	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	100 M cycles
Power (W)	42–210
Supply (V)	6.6–168 VDC
Power	Low power consumption; moderate torque output
Functional Advantages	Fast energising time and extremely high speed cycle rates; on/off or proportional mode operation



Technical Data

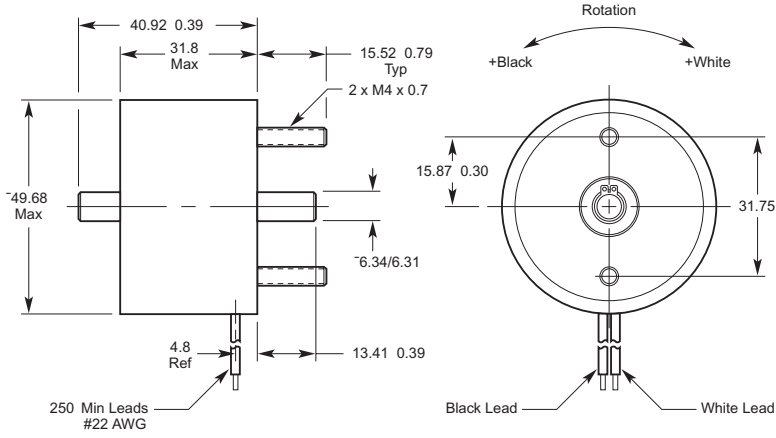
Dielectric Strength	1000 VRMS (23 awg) (wire diameter); 1200 VRMS (24-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimag are based on an unrestricted flow of air at 20°C, with the Ultimag mounted on the equivalent of an aluminium plate measuring 191 x 191 x 3.2 mm
Stroke	+/- 22.5°
Thermal Resistance	5.36°C/watt with heatsink; 12.9°C/watt without heatsink
Rotor Inertia	3.085 x 10 ⁻⁶ (kgm ²)
Peak Torque Rating (Tp)	0.7 Nm
Power Input	210 watts (stalled at Tp; 25°C; Pp)
Number of Phases	1
Static Friction (Tf)	7mNm
-3dB Closed Loop	66.5 Hz
Maximum Winding	180° C
Number of Poles	6

Preferred Range

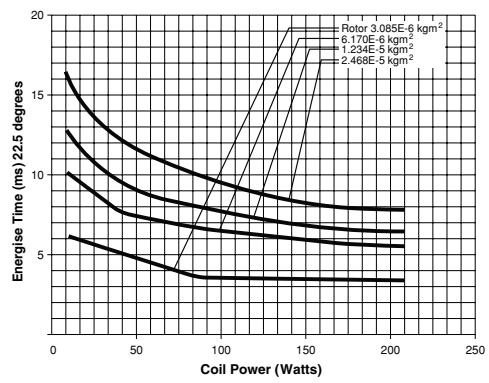
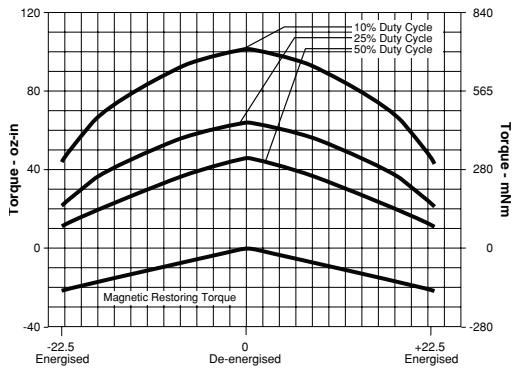
Type	Size	Nominal voltage	Duty Cycle	Nominal power	Net starting torque	max. "On time"
199173-025	∅ 49 X 31 mm	11.5 VDC	50%	42 W @20°C	0.33 Nm	40 sec

5EM

Dimensions



Performance chart



5EM

Ordering Reference

Type 199173-(0XX)

Performance		50%	25%	10%	
Maximum Duty Cycle*		40	15	4	
Maximum ON Time when pulsed continuously ¹	sec				
Typical Energise Time	msec ²	5.5	4.5	4.0	
Net Starting Torque	Nm	0.33	0.45	0.72	
Net Ending Torque	Nm	0.11	0.23	0.45	
Watts	@ 20°C	42	84	210	
Ampere Turns	@ 20°C	878	1242	1964	
Coil Data		# Turns ⁴	VDC (Nom)	VDC (Nom)	VDC (Nom)
awg (0XX) ³	Resistance (@20°C)				
23	1.05	128	6.6	9.4	14.8
24	2.24	213	9.7	13.7	21.7
25	3.16	240	11.5	16.3	25.8
26	4.45	270	13.7	19.3	30.6
27	8.50	404	18.9	26.7	42.2
28	11.90	452	22.3	31.6	50.0
29	21.10	630	29.7	42.1	67.0
30	29.50	705	35.2	49.8	78.7
31	50.30	948	45.9	65.0	103.0
32	82.70	1232	58.9	83.0	132.0
33	134.00	1576	74.9	106.0	168.0

¹ Continuously pulsed at stated watts and duty cycle

² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.

³ Other coil awg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

6EM

Ultimag® Series Rotary Actuators

Ultimag

6EM

Dimensions (mm)	∅ 59 x 41
Duty cycle	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	100 M cycles
Power (W)	32–320
Supply (V)	9.2–313 VDC
Power	Low power consumption; moderate torque output
Functional Advantages	Fast energising time and extremely high speed cycle rates; on/off or proportional mode operation



Technical Data

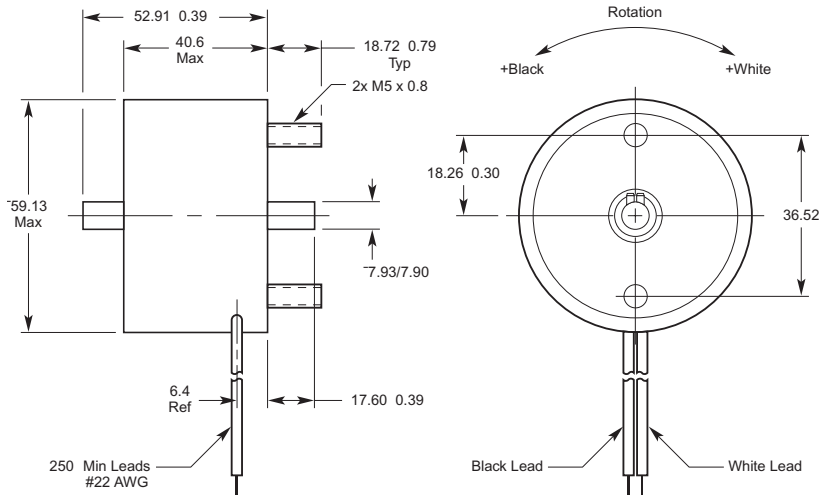
Dielectric Strength	1000 VRMS (23 awg) (wire diameter); 1200 VRMS (24-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimag are based on an unrestricted flow of air at 20°C, with the Ultimag mounted on the equivalent of an aluminium plate measuring 314,3 x 314,3 x 3,2 mm
Stroke	+/- 22,5°
Thermal Resistance	3.58° C/watt with heatsink; 8.52° C/watt without heatsink
Rotor Inertia	5.676 x 10 ⁻⁶ (kgm ²)
Peak Torque Rating (Tp)	1.6 Nm
Power Input	320 watts (stalled at Tp; 25°C; Pp)
Number of Phases	1
Static Friction (Tf)	7mNm
-3dB Closed Loop	12.8 Hz
Maximum Winding	180°C
Number of Poles	6

Preferred Range

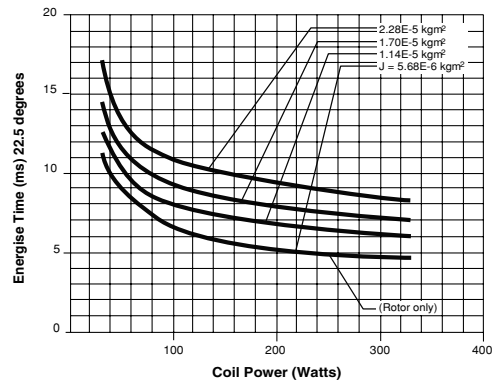
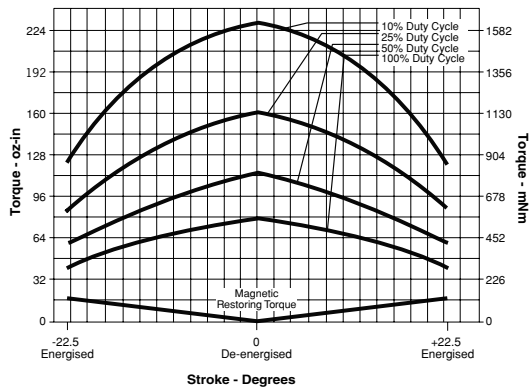
Type	Size	Nominal voltage	Duty Cycle	Nominal power	Net starting torque	max. "On time"
199174-023	∅ 59 X 41 mm	13 VDC	50%	64 W @20°C	0.70 Nm	40 sec

6EM

Dimensions



Performance chart



6EM

Ordering Reference

Type 199174-(0XX)

Performance			100%	50%	25%	10%	
Maximum Duty Cycle			∞	40	15	5	
Maximum ON Time when pulsed continuously ¹		sec					
Typical Energise Time		msec ²	17	12	10.5	8.5	
Net Starting Torque		Nm	0.58	0.70	1.15	1.61	
Net Ending Torque		Nm	0.29	0.44	0.58	0.84	
Watts		@ 20°C	32	64	128	320	
Ampere Turns		@ 20°C	980	1386	1960	3100	
Coil Data		awg (0XX) ³	Resistance (@20°C)	# Turns ⁴	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	2.65	267	9.2	13.0	18.4	29.1
	024	5.02	396	12.7	17.9	25.4	40.1
	025	7.03	444	15.0	21.2	30.0	47.4
	026	12.60	625	20.1	28.4	40.2	63.5
	027	17.60	700	23.8	33.6	47.5	75.1
	028	29.90	936	30.9	43.7	61.9	97.8
	029	49.50	1225	39.8	56.3	80.0	126.0
	030	79.70	1560	51.0	71.4	101.0	160.0
	031	126.50	1962	64.0	90.0	127.0	201.0
	032	198.30	2440	80.0	112.6	159.0	252.0
	033	306.20	2992	99.0	140.0	198.0	313.0

¹ Continuously pulsed at stated watts and duty cycle

² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.

³ Other coil awg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

BTA®-Series Brushless Torque

BTA Solenoids	Type	Preferred Products	Page
	2 EVM	195927-030	28
	3 EVM	195928-029	31
	4 EVM	195929-027	34
	5 EVM	195930-025	37
	6 EVM	195931-023	40

2EVM

BTA® Series Rotary Actuators

BTA Solenoids

2EVM

Dimensions (mm)	∅ 30 x 18
Duty cycle	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	100 M cycles
Power (W)	20–100
Supply (V)	3.1–80 VDC
Power	Low power consumption; moderate torque output
Functional Advantages	High speed cycle rate; can provide closed loop velocity and position control



Technical Data

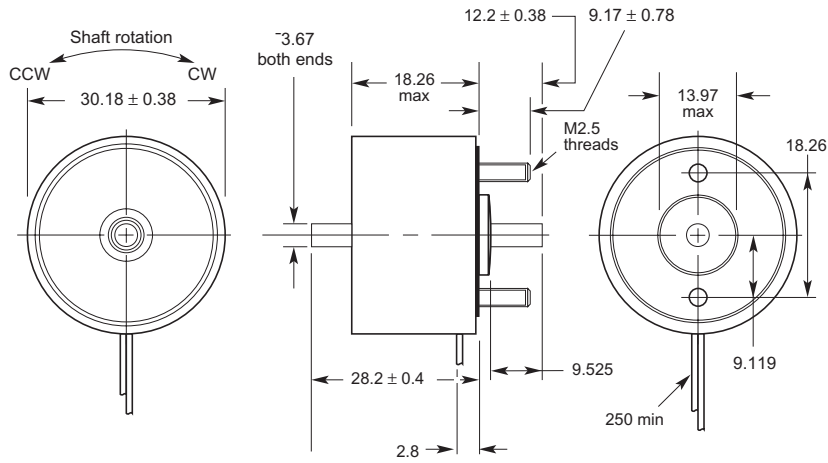
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimags are based on an unrestricted flow of air at 20°C, with the Ultimags mounted on the equivalent of an aluminium plate measuring 86 x 86 x 3.2 mm
Stroke	45°
Thermal Resistance	10.8 (°C/watt)
Rotor Inertia	2.56 (gm-cm ²)
Weight	85 g

Preferred Range

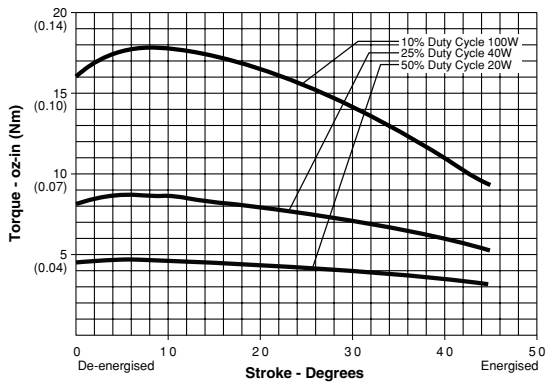
Type	Size	Nominal voltage	Duty Cycle	Nominal power	Net starting torque	max. "On time"	Rotation
195927-030	∅ 30 X 18 mm	12.4 VDC	50%	20 W @20°C	0.03 Nm	15 sec	Clockwise

2EVM

Dimensions



Performance chart



Notes:

Torque curves shown are without spring.
 Typical standard spring has a torque of 7,6 mNm.
 Torque values are for reference only.

2EVM

Ordering Reference

Type Clockwise Rotation 195927-(0XX)
 Anti Clockwise Rotation 195936-(0XX)

Performance		50%	25%	10%	
Maximum Duty Cycle*					
Maximum ON Time when pulsed continuously ¹		sec	15	6	
Typical Energise Time		msec ²	15	11	
Watts		@ 20°C	20	40	
Ampere Turns		@ 20°C	469	663	
Gross Starting Torque		Nm	0.03	0.06	
Gross Final Torque		Nm	0.02	0.04	
Maximum Stroke		degrees			
Coil Data		#	VDC	VDC	VDC
awg (0XX) ³	Resistance (@20°C)	Turns ⁴	(Nom)	(Nom)	(Nom)
024	0.47	72	3.1	4.3	6.9
025	0.67	82	3.7	5.2	8.2
026	0.94	92	4.3	6.1	9.7
027	1.33	104	5.2	7.3	11.5
028	2.86	174	7.6	10.7	16.9
029	4.01	195	9.0	12.7	20.0
030	7.69	292	12.4	17.5	27.7
031	10.80	328	14.7	20.8	32.9
032	19.26	460	19.6	27.8	43.9
033	26.96	515	23.2	32.8	52.0
034	45.82	690	30.3	42.8	68.0
035	63.76	768	35.7	50.0	80.0

¹ Continuously pulsed at stated watts and duty cycle

² Typical energise time based on a 3.53 mNm load including 14 gm-cm² of inertia

³ Other coil awg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.

3EVM

BTA® Series Rotary Actuators

BTA Solenoids

3EVM

Dimensions (mm)	∅ 35 x 23
Duty cycle	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	100 M cycles
Power (W)	13–130
Supply (V)	1.9–78.7 VDC
Power	Low power consumption; moderate torque output
Functional Advantages	High speed cycle rate; can provide closed loop velocity and position control



Technical Data

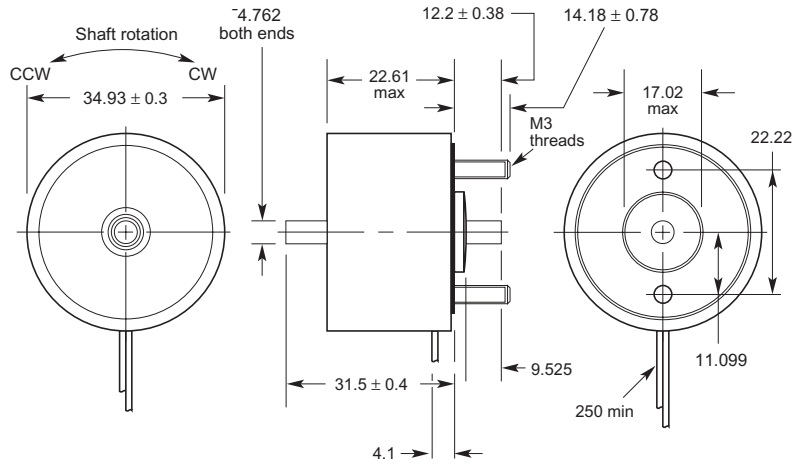
Dielectric Strength	1,000 VRMS (23-28 awg) (wire diameter); 1,200 VRMS (29-34 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimag are based on an unrestricted flow of air at 20°C, with the Ultimag mounted on the equivalent of an aluminium plate measuring 117 x 117 x 3,2 mm
Stroke	45°
Thermal Resistance	8.53 (°C/watt)
Rotor Inertia	9.14 (gm-cm ²)
Weight	142 g

Preferred Range

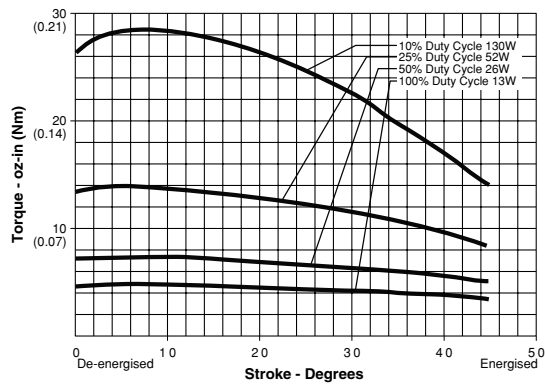
Type	Size	Nominal voltage	Duty Cycle	Nominal power	Net starting torque	max. "On time"	Rotation
195928-029	∅ 35 X 23 mm	10,5 VDC	50%	26 W @20°C	0,05 Nm	10 sec	Clockwise

3EVM

Dimensions



Performance chart



Notes:
 Torque curves shown are without spring.
 Typical standard spring has a torque of 7,6 mNm.
 Torque values are for reference only.

3EVM

Ordering Reference

Type	Clockwise Rotation 195928-(0XX) Anti Clockwise Rotation 195937-(0XX)						
Performance	Maximum Duty Cycle		100%	50%	25%	10%	
	Maximum ON Time when pulsed continuously ¹	sec	∞	10	3	1	
	Typical Energise Time	msec ²	25	17	12	9	
	Watts	@ 20°C	13	26	52	130	
	Ampere Turns	@ 20°C	362	512	729	1,144	
	Gross Starting Torque	Nm	0.03	0.05	0.10	0.19	
	Gross Final Torque	Nm	0.03	0.04	0.06	0.10	
	Maximum Stroke	degrees	45				
Coil Data	awg (0XX) ³	Resistance (@20°C)	# Turns ⁴	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	0.26	44	1.9	2.6	3.7	5.9
	024	0.38	50	2.2	3.1	4.4	7.0
	025	0.53	56	2.6	3.7	5.2	8.3
	026	1.54	126	4.5	6.3	9.0	14.2
	027	2.15	140	5.3	7.5	10.6	16.7
	028	3.04	158	6.3	8.9	12.6	19.9
	029	4.24	176	7.4	10.5	14.9	23.5
	030	9.16	297	10.9	15.4	21.8	34.5
	031	12.90	333	12.9	18.3	25.9	40.9
	032	18.04	372	15.3	21.6	30.6	48.4
	033	34.10	552	21.0	29.8	42.1	66.5
	034	47.70	616	25.0	35.2	49.8	78.7

¹ Continuously pulsed at stated watts and duty cycle

² Typical energise time based on a 3.53 mNm load including 14 gm-cm² of inertia

³ Other coil awg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.

4EVM

BTA® Series Rotary Actuators

BTA Solenoids

4EVM

Dimensions (mm)	∅ 41 x 27
Duty cycle	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	Field proven over 100 million cycles
Power (W)	14.5–145
Supply (V)	3.2–115 VDC
Power	Low power consumption; moderate torque output
Functional Advantages	High speed cycle rate; can provide closed loop velocity and position control



Technical Data

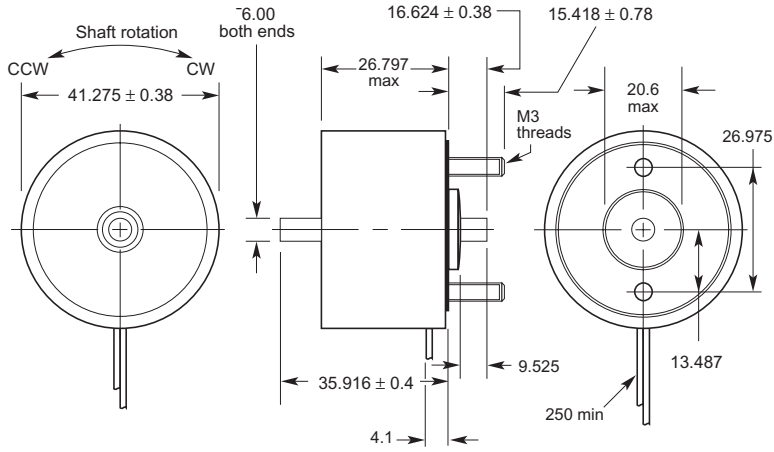
Dielectric Strength	1000 VRMS (23-24 awg) (wire diameter); 1200 VRMS (25-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimags are based on an unrestricted flow of air at 20°C, with the Ultimags mounted on the equivalent of an aluminium plate measuring 159 x 159 x 3.2 mm
Stroke	45°
Thermal Resistance	7.63 (°C/watt)
Rotor Inertia	13.92 (gm-cm ²)
Weight	227 g

Preferred Range

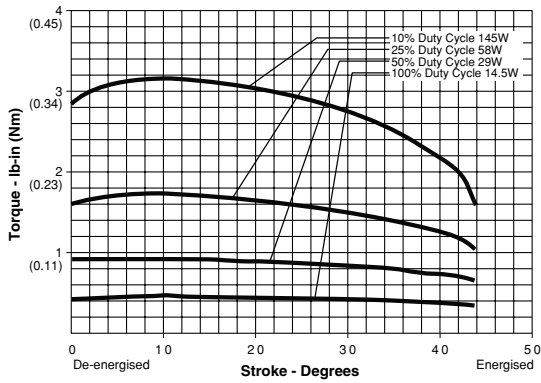
Type	Size	Nominal voltage	Duty Cycle	Nominal power	Net starting torque	max. "On time"	Rotation
195929-027	∅ 41 X 27 mm	12.9 VDC	50%	29 W @20°C	0.11 Nm	40 sec	Clockwise

4EVM

Dimensions



Performance chart



Notes:
 Torque curves shown are without spring.
 Typical standard spring has a torque of 7,6 mNm.
 Torque values are for reference only.

4EVM

Ordering Reference

Type	Clockwise Rotation 195929-(0XX) Anti Clockwise Rotation 195938-(0XX)						
Performance	Maximum Duty Cycle		100%	50%	25%	10%	
	Maximum ON Time when pulsed continuously ¹	sec	∞	40	15	4	
	Typical Energise Time	msec ²	27	19	14	10	
	Watts	@ 20°C	14.5	29	58	145	
	Ampere Turns	@ 20°C	510	721	1020	1613	
	Gross Starting Torque	Nm	0.05	0.11	0.18	0.33	
	Gross Final Torque	Nm	0.04	0.07	0.12	0.18	
	Maximum Stroke	degrees	45				
Coil Data	avg (0XX) ³	Resistance (@20°C)	# Turns ⁴	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	0.71	104	3.2	4.5	6.4	10.1
	024	1.54	174	4.7	6.7	9.4	14.9
	025	2.15	195	5.6	7.9	11.2	17.6
	026	3.01	219	6.6	9.3	13.2	20.9
	027	5.78	328	9.2	12.9	18.3	28.9
	028	8.09	368	10.8	15.3	21.7	34.3
	029	14.40	515	14.5	20.4	28.9	45.7
	030	20.11	575	18.9	26.7	37.7	59.
	031	34.40	774	22.3	31.6	44.6	71.0
	032	56.60	1008	28.7	40.5	57.0	91.0
	033	91.40	1288	36.0	52.0	73.0	115.0

¹ Continuously pulsed at stated watts and duty cycle

² Typical energise time based on a 3,53 mNm load including 14 gm-cm² of inertia

³ Other coil avg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.

5 EVM

BTA® Series Rotary Actuators

BTA Solenoids

5 EVM

Dimensions (mm)	∅ 49 x 32
Duty cycle	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	100 M cycles
Power (W)	21–210
Supply (V)	4.7–168 VDC
Power	Low power consumption; moderate torque output
Functional Advantages	High speed cycle rate; can provide closed loop velocity and position control



Technical Data

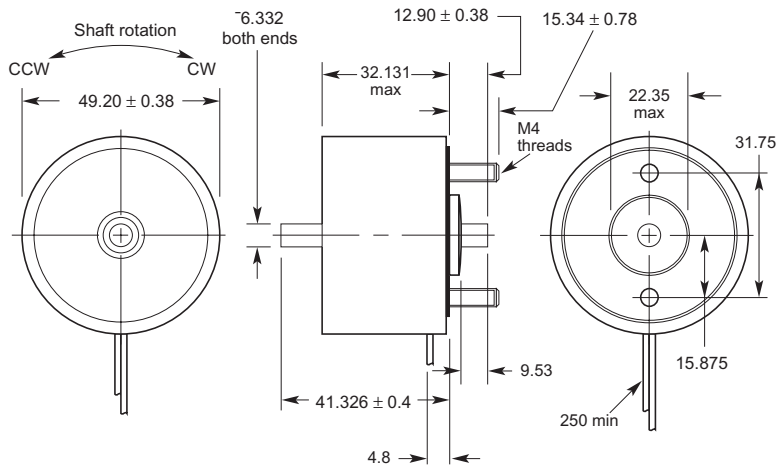
Dielectric Strength	1000 VRMS (23 awg) (wire diameter); 1200 VRMS (24-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimags are based on an unrestricted flow of air at 20°C, with the Ultimags mounted on the equivalent of an aluminium plate measuring 191 x 191 x 3,2 mm
Stroke	45°
Thermal Resistance	5.36 (°C/watt)
Rotor Inertia	30.36 (gm-cm ²)
Weight	382 g

Preferred Range

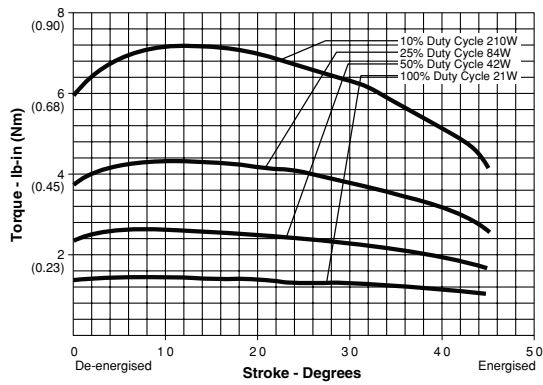
Type	Size	Nominal voltage	Duty Cycle	Nominal power	Net starting torque	max. "On time"	Rotation
195930-025	∅ 49 X 32 mm	11,5 VDC	50%	42 W @20°C	0,27 Nm	40 sec	Clockwise

5EVM

Dimensions



Performance chart



Notes:

Torque curves shown are without spring.

Typical standard spring has a torque of 7,6 mNm.

Torque values are for reference only.

5EVM

Ordering Reference

Type	Clockwise Rotation 195930-(0XX) Anti Clockwise Rotation 195939-(0XX)						
Performance	Maximum Duty Cycle		100%	50%	25%	10%	
	Maximum ON Time when pulsed continuously ¹	sec	∞	40	15	4	
	Typical Energise Time	msec ²	27	18	14	10	
	Watts	@ 20°C	21	42	84	210	
	Ampere Turns	@ 20°C	621	878	1242	1964	
	Gross Starting Torque	Nm	0.16	0.27	0.43	0.69	
	Gross Final Torque	Nm	0.12	0.19	0.30	0.48	
	Maximum Stroke	degrees	45				
Coil Data	awg (0XX) ³	Resistance (@20°C)	# Turns ⁴	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	1.05	128	4.7	6.6	9.4	14.8
	024	2.24	213	6.9	9.7	13.7	21.7
	025	3.16	240	8.1	11.5	16.3	25.8
	026	4.45	270	9.7	13.7	19.3	30.6
	027	8.50	404	13.4	18.9	26.7	42.2
	028	11.90	452	15.8	22.3	31.6	50.0
	029	21.10	630	21.0	29.7	42.1	67.0
	030	29.50	705	24.9	35.2	49.8	78.7
	031	50.30	948	32.5	46.0	65.0	103.0
	032	82.70	1232	41.7	59.0	83.0	132.0
	033	134.00	1576	53.0	75.0	106.0	168.0

¹ Continuously pulsed at stated watts and duty cycle

² Typical energise time based on a 3,53 mNm load including 14 gm-cm² of inertia

³ Other coil awg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.

6EVM

BTA® Series Rotary Actuators

BTA Solenoids

6EVM

Dimensions (mm)	∅ 59 x 41
Duty cycle	continuous or intermittent
Operation	Quiet, shock-free operation; true rotary motion with no axial displacement
Life	100 M cycles
Power (W)	32–320
Supply (V)	9.2–313 VDC
Power	Low power consumption; moderate torque output
Functional Advantages	High speed cycle rate; can provide closed loop velocity and position control



Technical Data

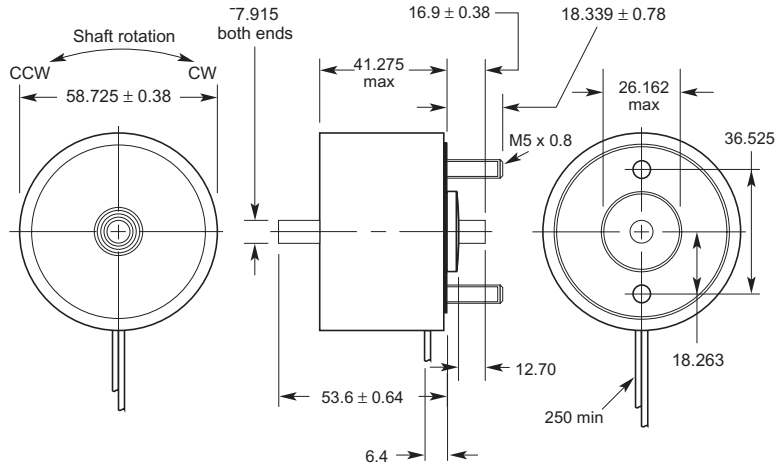
Dielectric Strength	1,000 VRMS (23 awg) (wire diameter); 1200 VRMS (24-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimags are based on an unrestricted flow of air at 20°C, with the Ultimags mounted on the equivalent of an aluminium plate measuring 314 x 314 x 3.2 mm
Stroke	45°
Thermal Resistance	3.58 (°C/watt)
Rotor Inertia	67.15 (gm-cm ²)
Weight	709 g

Preferred Range

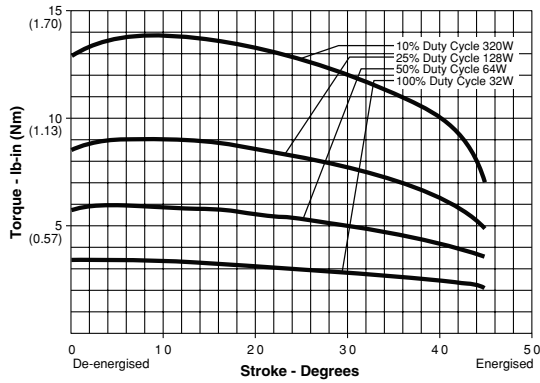
Type	Size	Nominal voltage	Duty Cycle	Nominal power	Net starting torque	max. "On time"	Rotation
195931-023	∅ 59 X 41 mm	13 VDC	50%	64 W @20°C	0.67 Nm	40 sec	Clockwise

6EVM

Dimensions



Performance chart



Notes:

- Torque curves shown are without spring.
- Typical standard spring has a torque of 7,6 mNm.
- Torque values are for reference only.

6EVM

Ordering Reference

Type	Clockwise Rotation 195931-(0XX) Anti Clockwise Rotation 195940-(0XX)						
Performance	Maximum Duty Cycle		100%	50%	25%	10%	
	Maximum ON Time when pulsed continuously ¹	sec	∞	40	15	5	
	Typical Energise Time	msec ²	48	21	15	11	
	Watts	@ 20°C	32	64	128	320	
	Ampere Turns	@ 20°C	980	1386	1960	3100	
	Gross Starting Torque	Nm	0.39	0.67	0.99	1.48	
	Gross Final Torque	Nm	0.23	0.43	0.58	0.81	
	Maximum Stroke	degrees	45				
Coil Data	awg (0XX) ³	Resistance (@20°C)	# Turns ⁴	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	2.65	267	9.2	13.0	18.4	29.1
	024	5.02	396	12.7	17.9	25.4	40.1
	025	7.03	444	15.0	21.2	30.0	47.4
	026	12.60	625	20.1	28.4	40.2	63.5
	027	17.60	700	23.8	33.6	47.5	75.1
	028	29.90	936	30.9	43.7	61.9	97.8
	029	49.50	1225	39.8	56.0	80.0	126.0
	030	79.70	1560	51.0	71.0	101.0	160.0
	031	126.50	1962	64.0	90.0	127.0	201.0
	032	198.30	2440	80.0	113.0	159.0	252.0
	033	306.20	2992	99.0	140.0	198.0	313.0

¹ Continuously pulsed at stated watts and duty cycle

² Typical energise time based on a 3.53 mNm load including 14 gm-cm² of inertia

³ Other coil awg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.

Rotary Solenoids

Rotary	Type	Preferred Products	Page
	1 E	M-15218-030	46
	2 E	M-2994-028	49
	3 B	M-910-282-326	52
	3 E	M-2616-027	55
	4 E	M-15237-025	58
	5 B	M-910-282-523	61
	5 S	M-3397-023	64
	6 S	M-15064-023	67
	7 S	M-15614-023	70

1E

Rotary Solenoids

Rotary

1E

Dimensions (mm)	∅ 25 x 16
Duty cycle	continuous or intermittent
Operation	"Snap" acting engagement; some axial displacement necessary
Life	1 million cycles
Power (W)	10,5–108
Supply (V)	2,9–94 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility; on/off operation



Technical Data

Dielectric Strength	1000 VRMS, all coils
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C. mounted on the equivalent of an aluminium plate measuring 76.2 x 76.2 x 3.2 mm
Coil Resistance	±5% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	6.8 mNm ±20%
Weight	42.5 g

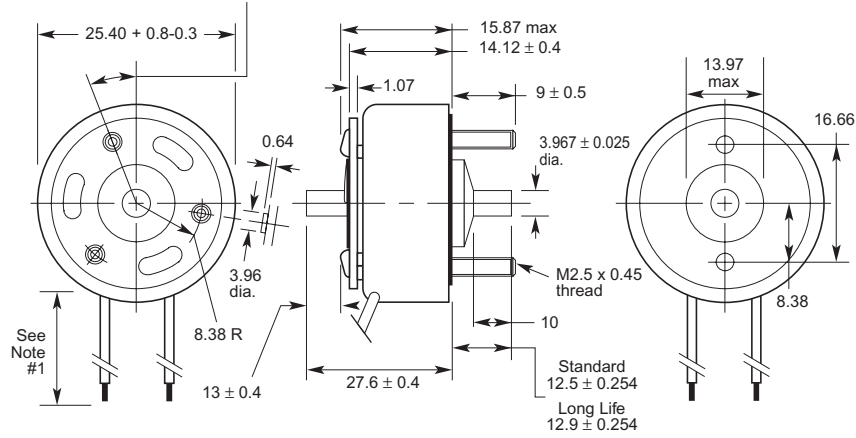
Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
M-15218-030	∅ 25 X 16 mm	9,2 VDC	50%	45°	0,6 mm	10,5 W @20°C	0,01 Nm	100 sec	Clockwise

1E

Dimensions

3 holes equally spaced located
 1/2 rotary stroke $\pm 3j$ to left
 of centre for R.H. stroke, right of
 centre for L.H. stroke. M2 x 0.4 thread



1E

Ordering Reference

Type	M-15215-(0XX)	Stroke 25° CW				
	M-15216-(0XX)	Stroke 25° CCW				
	M-1305-(0XX)	Stroke 35° CW				
	M-15217-(0XX)	Stroke 35° CCW				
	M-15218-(0XX)	Stroke 45° CW				
	M-15219-(0XX)	Stroke 45° CCW				
Performance Specifications			50%	25%	10%	5%
	Stroke 25°	Available Torque ⁵ (Nm)	0.02	0.05	0.09	0.00
		Energising Time (msec)	9.9	7.3	5.7	4.7
	Stroke 35°	Available Torque ⁵ (Nm)	0.00	0.00	0.00	0.00
		Energising Time (msec)	*	*	*	*
	Stroke 45°	Available Torque ⁵ (Nm)	0.01	0.02	0.05	0.07
		Energising Time (msec)	14.2	10.0	7.2	6.0
Coil Performance	Maximum ON Time (sec) when pulsed continuously ¹		100	36	7	2.5
	Watts (@ 20°C)		10.5	21	54	108
	Ampere Turns (@ 20°C)		492	695	1105	1560
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)
	025	0.83	140	2.9	4.1	6.5
	026	1.38	186	3.7	5.2	8.2
	027	1.91	210	4.5	6.3	10.1
	028	3.17	273	5.7	8.1	12.8
	029	5.17	352	7.2	10.2	16.2
	030	8.25	441	9.2	13.0	21.0
	031	12.95	550	11.6	16.4	26.0
	032	20.71	682	14.9	21.0	34.0
	033	30.60	828	18.2	26.0	41.0
	034	50.95	1078	23.0	33.0	52.0
	035	83.92	1392	30.0	42.0	67.0

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available – please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.
 * Please enquire for sizes and strokes not shown.

2E

Rotary Solenoids

Rotary

2E

Dimensions (mm)	∅ 29 x 17
Duty cycle	continuous or intermittent
Operation	"Snap" acting engagement; some axial displacement necessary
Life	1 million cycles
Power (W)	7-140
Supply (V)	2.2-128 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility; on/off operation



Technical Data

Dielectric Strength	1000 VRMS, all coils
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 84,7 x 84,7 x 3,2 mm
Coil Resistance	±5% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	6.8 mNm ±20%
Weight	56.7 g

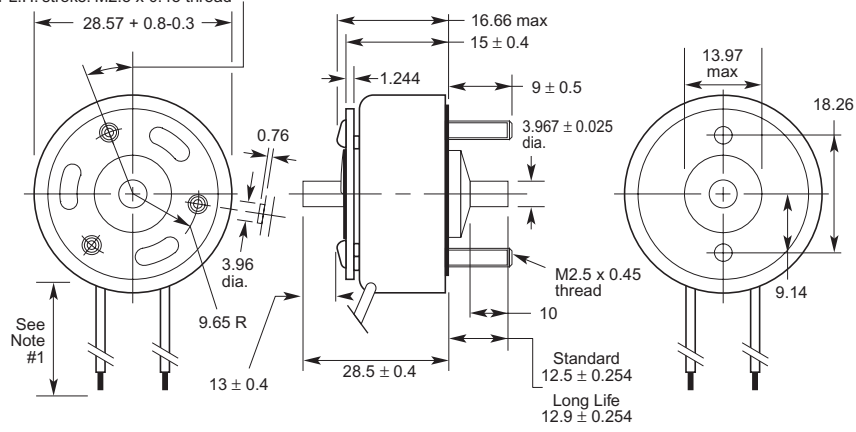
Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
M-2411-033	∅ 29 X 17 mm	5,7 VDC	100%	35°	0,6 mm	7 W @20°C	0,02 Nm	∞ sec	Clockwise

2E

Dimensions

3 holes equally spaced located
1/2 rotary stroke $\pm 3j$ to left
of centre for R.H. stroke, right of
centre for L.H. stroke. M2.5 x 0.45 thread



2E

Ordering Reference

Type	M-2411-(0XX)	Stroke 25° CW						
	M-2537-(0XX)	Stroke 25° CCW						
	M-2994-(0XX)	Stroke 35° CW						
	M-15220-(0XX)	Stroke 35° CCW						
	M-3244-(0XX)	Stroke 45° CW						
	M-3245-(0XX)	Stroke 45° CCW						
Performance Specifications			100%	50%	25%	10%	5%	
	Stroke 25°	Available Torque ⁵ (Nm)	0.02	0.05	0.08	0.16	0.20	
		Energising Time (msec)	13.1	9.5	7.5	5.9	5.0	
	Stroke 35°	Available Torque ⁵ (Nm)	0.02	0.03	0.06	0.13	0.15	
		Energising Time (msec)	*	*	*	*	*	
	Stroke 45°	Available Torque ⁵ (Nm)	0.01	0.02	0.05	0.08	0.10	
		Energising Time (msec)	23.2	15.0	11.0	8.4	7.0	
Coil Performance	Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	7	2.5	
	Watts (@ 20°C)		7	14	28	70	140	
	Ampere Turns (@ 20°C)		425	602	849	1350	1904	
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	024	0.68	130	2.2	3.2	4.5	7.1	10.0
	025	1.16	174	2.8	4.0	5.7	9.0	12.7
	026	1.96	231	3.6	5.1	7.2	11.5	16.2
	027	3.16	296	4.5	6.4	9.0	14.4	20.0
	028	5.10	378	5.7	8.1	11.5	18.2	26.0
	029	6.94	423	7.0	9.9	13.9	22.0	31.0
	030	11.03	530	8.8	12.5	17.7	28.0	40.0
	031	16.85	649	11.0	15.6	22.0	35.0	49.0
	032	28.15	858	13.9	19.8	28.0	44.0	63.0
	033	42.75	1036	17.5	25.0	35.0	56.0	79.0
	034	69.56	1312	23.0	32.0	45.0	72.0	101.0
	035	112.00	1674	29.0	40.0	57.0	91.0	128.0

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available — please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.
 * Please enquire for sizes and strokes not shown.

3B

Rotary Solenoids

Rotary

3B

Dimensions (mm)	∅ 33 x 22
Duty cycle	continuous or intermittent
Operation	clockwise or anti clockwise
Life	1 million cycles
Power (W)	10–200
Supply (V)	2.6–123 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility; on/off operation



Technical Data

Dielectric Strength	23-27 awg (wire diameter), 1000 VRMS; 28-33 awg (wire diameter), 1200 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 85.7 x 85.7 x 3.2 mm
Coil Resistance	±10% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	13.6 mNm ±20%
Weight	113.4 g

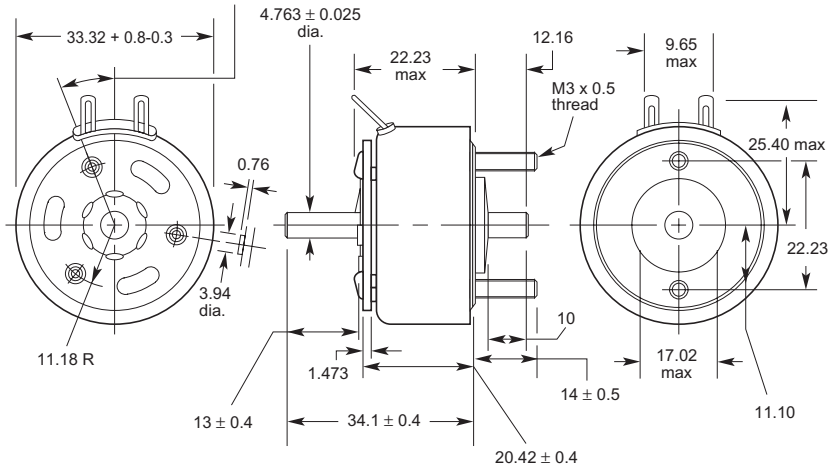
Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
910-282-326	∅ 33 X 22 mm	12.5 VDC	50%	45°	0.8 mm	20 W @20°C	0.10 Nm	100 sec	Clockwise

3B

Dimensions

3 holes equally spaced located
 1/2 rotary stroke $\pm 3_i$ to left
 of centre for R.H. stroke, right of
 centre for L.H. stroke. M2.5 x 0.45 thread



3B

Ordering Reference

Type	M-910-280-(3XX)	Stroke 25° CW
	M-910-285-(3XX)	Stroke 25° CCW
	M-910-281-(3XX)	Stroke 35° CW
	M-910-286-(3XX)	Stroke 35° CCW
	M-910-282-(3XX)	Stroke 45° CW
	M-910-287-(3XX)	Stroke 45° CCW
	M-910-283-(3XX)	Stroke 67.5° CW
	M-910-288-(3XX)	Stroke 67.5° CCW

Performance Specifications		100%	50%	25%	10%	5%		
Stroke 25°	Available Torque ⁵ (Nm)	0.05	0.08	0.15	0.31	0.37		
	Energising Time (msec)	16.5	11.3	8.9	6.8	5.9		
Stroke 35°	Available Torque ⁵ (Nm)	0.03	0.07	0.12	0.23	0.26		
	Energising Time (msec)	*	*	*	*	*		
Stroke 45°	Available Torque ⁵ (Nm)	0.02	0.05	0.09	0.16	0.20		
	Energising Time (msec)	24.0	15.6	12.1	9.4	7.7		
Stroke 67.5°	Available Torque ⁵ (Nm)	0.01	0.02	0.05	0.06	0.09		
	Energising Time (msec)	*	*	*	*	*		
Coil Performance	Maximum ON Time (sec) when pulsed continuously ¹	∞	100	36	8	2.8		
	Watts (@ 20°C)	10	20	40	100	200		
	Ampere Turns (@ 20°C)	550	785	1100	1740	2464		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	323	0.65	136	2.6	3.7	5.2	8.3	11.8
	324	1.13	188	3.3	4.7	6.6	10.5	14.8
	325	1.86	238	4.3	6.1	8.6	13.6	19.3
	326	2.95	300	5.4	7.7	10.8	17.1	24.0
	327	4.67	377	6.8	9.7	13.6	22.0	31.0
	328	7.40	466	8.7	12.5	17.5	28.0	39.0
	329	11.46	576	10.9	15.6	22.0	35.0	49.0
	330	18.40	720	14.1	20.0	28.0	45.0	63.0
	331	29.60	960	17.0	24.0	34.0	54.0	76.0
	332	45.60	1157	22.0	31.0	43.0	69.0	97.0
	333	73.20	1470	28.0	39.0	55.0	87.0	123.0

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available — please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.
 * Please enquire for sizes and strokes not shown.

3E

Rotary Solenoids

Rotary

3E

Dimensions (mm)	∅ 33 x 20
Duty cycle	continuous or intermittent
Operation	clockwise or anti clockwise
Life	1 million cycles
Power (W)	9–180
Supply (V)	2.6–118 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility; on/off operation



Technical Data

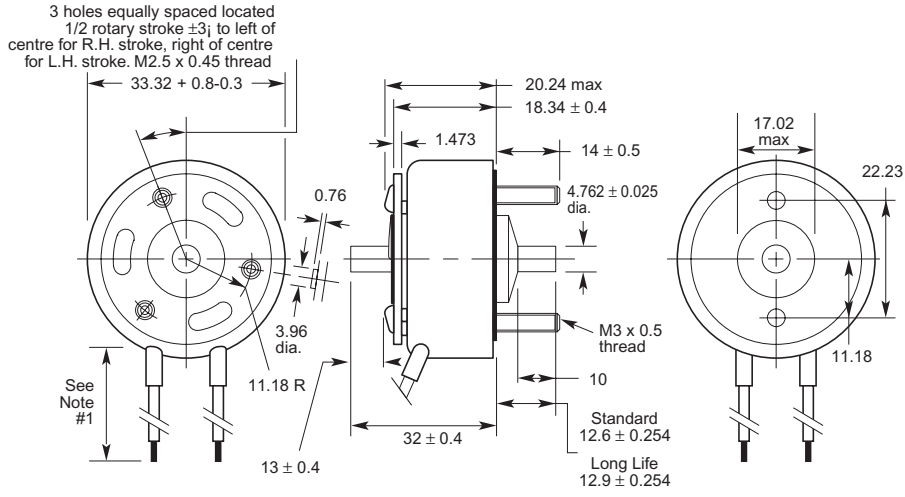
Dielectric Strength	23-27 awg (wire diameter), 1000 VRMS; 28-33 awg (wire diameter), 1200 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 117,5 x 117,5 x 3,2 mm
Coil Resistance	±5% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	13,6 mNm ±20%
Weight	99,2 g

Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
M-2616-027	∅ 33 X 20 mm	9,4 VDC	50%	45°	0,8 mm	18 W @20°C	0,10 Nm	100 sec	Clockwise

3E

Dimensions



3E

Ordering Reference

Type	M-2412-(0XX)	Stroke 25° CW
	M-15128-(0XX)	Stroke 25° CCW
	M-2722-(0XX)	Stroke 35° CW
	M-2723-(0XX)	Stroke 35° CCW
	M-2616-(0XX)	Stroke 45° CW
	M-15020-(0XX)	Stroke 45° CCW
	M-2542-(0XX)	Stroke 67.5° CW
	M-2940-(0XX)	Stroke 67.5° CCW

Performance Specifications		100%	50%	25%	10%	5%
Stroke 25°	Available Torque ⁵ (Nm)	0.05	0.09	0.16	0.31	0.37
	Energising Time (msec)	16.9	12.0	9.3	7.1	6.2
Stroke 35°	Available Torque ⁵ (Nm)	0.03	0.07	0.12	0.23	0.26
	Energising Time (msec)	*	*	*	*	*
Stroke 45°	Available Torque ⁵ (Nm)	0.02	0.05	0.09	0.16	0.21
	Energising Time (msec)	29.8	17.8	13.1	10.0	8.1
Stroke 67.5°	Available Torque ⁵ (Nm)	0.01	0.02	0.05	0.08	0.11
	Energising Time (msec)	*	*	*	*	*

Coil Performance		∞	100	36	8	2.8
Maximum ON Time (sec) when pulsed continuously ¹						
Watts (@ 20°C)		9	18	36	90	180
Ampere Turns (@ 20°C)		535	756	1070	1690	2397

Coil Data	awg	Resistance	#	VDC	VDC	VDC	VDC	VDC
	(0XX) ²	(@20°C)	Turns ³	(Nom)	(Nom)	(Nom)	(Nom)	(Nom)
	023	0.70	145	2.6	3.7	5.2	8.2	11.6
	024	1.18	192	3.3	4.6	6.6	10.4	14.7
	025	1.97	252	4.2	5.9	8.4	13.2	18.7
	026	3.26	328	5.3	7.5	10.6	16.8	24.0
	027	5.04	405	6.7	9.4	13.3	21.0	30.0
	028	8.02	510	8.4	11.9	16.8	27.0	38.0
	029	12.21	627	10.4	14.7	21.0	33.0	47.0
	030	19.20	780	13.2	18.6	26.0	42.0	59.0
	031	31.84	1008	16.9	24.0	34.0	53.0	76.0
	032	46.97	1215	21.0	29.0	41.0	65.0	93.0
	033	75.30	1530	26.0	37.0	53.0	83.0	118.0

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available – please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.

* Please enquire for sizes and strokes not shown.

4E

Rotary Solenoids

Rotary

4E

Dimensions (mm)	∅ 40 x 24
Duty cycle	continuous or intermittent
Operation	clockwise or anti clockwise
Life	1 million cycles
Power (W)	12.5–250
Supply (V)	4.3–187 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility; on/off operation



Technical Data

Dielectric Strength	23-24 awg (wire diameter), 1000 VRMS; 25-33 awg (wire diameter), 1200 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 158.8 x 158.8 x 3.2 mm
Coil Resistance	±5% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	20.3 mNm ±20%
Weight	198.4 g

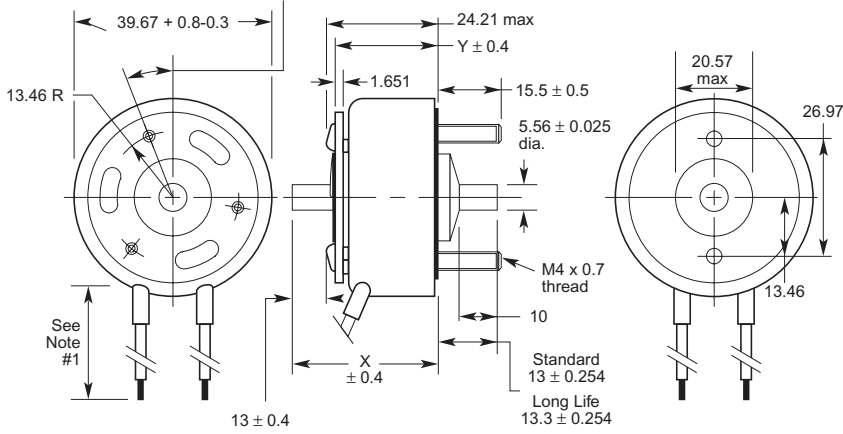
Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
M-215237-025	∅ 40 X 24 mm	9.2 VDC	50%	45°	0.9 mm	25 W @20°C	0.20 Nm	100 sec	Clockwise

4E

Dimensions

3 holes equally spaced located
 1/2 rotary stroke $\pm 3_j$ to left
 of centre for R.H. stroke, right of
 centre for L.H. stroke. M3 x 0.5 thread



"X" DIMENSION - - - 25° 35° & 45° = 36.2
 $67-1/2^\circ$ & 95° = 36.3
 "Y" DIMENSION - - - 25° 35° & 45° = 22.33
 $67-1/2^\circ$ & 95° = 22.48

4E

Ordering Reference

Type	M-2413-(0XX)	Stroke 25° CW	M-15228-(0XX)	Stroke 55° CW
	M-15135-(0XX)	Stroke 25° CCW	M-15021-(0XX)	Stroke 67.5° CW
	M-2995-(0XX)	Stroke 35° CW	M-15239-(0XX)	Stroke 67.5° CCW
	M-15236-(0XX)	Stroke 35° CCW	M-2645-(0XX)	Stroke 95° CW
	M-15237-(0XX)	Stroke 45° CW	M-1115-(0XX)	Stroke 95° CCW
	M-15238-(0XX)	Stroke 45° CCW		

Performance Specifications		100%	50%	25%	10%	5%
Stroke 25°	Available Torque ⁵ (Nm)	0.10	0.20	0.36	0.52	0.60
	Energising Time (msec)	19.1	13.9	11.2	8.3	7.2
Stroke 35°	Available Torque ⁵ (Nm)	0.07	0.13	0.23	0.36	0.40
	Energising Time (msec)	*	*	*	*	*
Stroke 45°	Available Torque ⁵ (Nm)	0.05	0.10	0.18	0.30	0.36
	Energising Time (msec)	28.9	20.3	15.4	11.3	9.2
Stroke 55°	Available Torque ⁵ (Nm)	*	*	*	*	*
	Energising Time (msec)	*	*	*	*	*
Stroke 67.5°	Available Torque ⁵ (Nm)	0.03	0.05	0.09	0.18	0.21
	Energising Time (msec)	*	*	*	*	*
Stroke 95°	Available Torque ⁵ (Nm)	0.02	0.03	0.07	0.11	0.13
	Energising Time (msec)	*	*	*	*	*
Coil Performance	Maximum ON Time (sec) when pulsed continuously ¹	∞	100	36	9	3.2
	Watts (@ 20°C)	12.5	25	50	125	250
	Ampere Turns (@ 20°C)	714	1000	1425	2250	3200
	Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)
	023	1.59	266	4.3	6.0	8.5
	024	2.20	301	5.2	7.3	10.4
	025	3.54	384	6.6	9.2	13.1
	026	5.67	486	8.3	11.7	16.6
	027	8.76	600	10.4	14.6	21.0
	028	13.80	748	13.2	18.5	26.0
	029	22.60	975	16.6	23.0	33.0
	030	34.80	1190	21.0	29.0	42.0
	031	56.70	1520	27.0	37.0	53.0
	032	88.30	1908	33.0	46.0	66.0
	033	138.00	2360	42.0	59.0	83.0

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available – please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.
 * Please enquire for sizes and strokes not shown.

5 B

Rotary Solenoids

Rotary

5B

Dimensions (mm)	∅ 48 x 26
Duty cycle	continuous or intermittent
Operation	clockwise or anti clockwise
Life	1 million cycles
Power (W)	21–420
Supply (V)	6,1–273 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility: on/off operation



Technical Data

Dielectric Strength	23 awg (wire diameter), 1000 VRMS; 24-33 awg (wire diameter), 1200 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 190,5 x 190,5 x 3,2 mm
Coil Resistance	±10% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	28,2 mNm ±20%
Weight	283,5 g

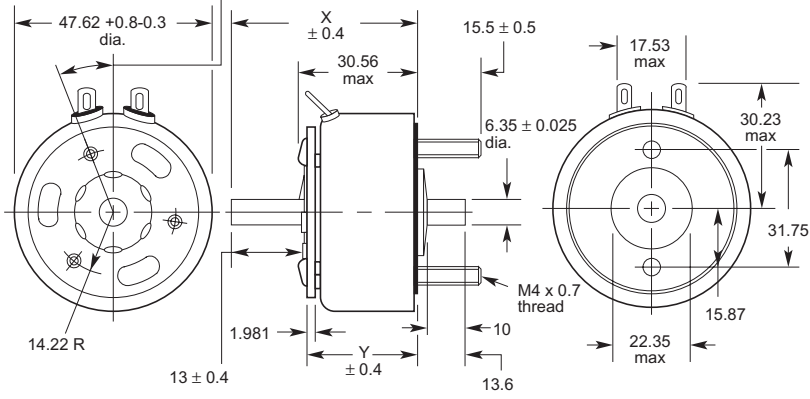
Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
910-282-523	∅ 48 X 26 mm	8,5 VDC	50%	45°	1,1 mm	42 W @20°C	0,46 Nm	100 sec	Clockwise

5B

Dimensions

3 holes equally spaced located
 1/2 rotary stroke $\pm 3_i$ to left
 of centre for R.H. stroke, right of
 centre for L.H. stroke. M3 x 0.5 thread



"X" DIMENSION	---	25°	=	41.5
		35° & 45°	=	41.6
		67-1/2°	=	41.7
		95°	=	41.8
"Y" DIMENSION	---	25°	=	27.63
		35° & 45°	=	27.71
		67-1/2°	=	27.84
		95°	=	27.96

5B

Ordering Reference

Type	M-910-280-(5XX)	Stroke 25° CW	M-910-283-(5XX)	Stroke 67.5° CW
	M-910-285-(5XX)	Stroke 25° CCW	M-910-288-(5XX)	Stroke 67.5° CCW
	M-910-281-(5XX)	Stroke 35° CW	M-910-284-(5XX)	Stroke 95° CW
	M-910-286-(5XX)	Stroke 35° CCW	M-910-289-(5XX)	Stroke 95° CCW
	M-910-282-(5XX)	Stroke 45° CW		
	M-910-287-(5XX)	Stroke 45° CCW		

Performance Specifications		100%	50%	25%	10%	5%
Stroke 25°	Available Torque ⁵ (Nm)	0.21	0.40	0.67	0.95	1.15
	Energising Time (msec)	19.6	14.9	12.0	9.4	7.7
Stroke 35°	Available Torque ⁵ (Nm)	0.10	0.24	0.47	0.79	0.95
	Energising Time (msec)	*	*	*	*	*
Stroke 45°	Available Torque ⁵ (Nm)	0.08	0.20	0.37	0.58	0.69
	Energising Time (msec)	29.0	21.2	16.5	12.6	10.2
Stroke 67.5°	Available Torque ⁵ (Nm)	0.06	0.12	0.23	0.37	0.45
	Energising Time (msec)	*	*	*	*	*
Stroke 95°	Available Torque ⁵ (Nm)	0.02	0.04	0.10	0.18	0.21
	Energising Time (msec)	*	*	*	*	*
Coil Performance	Maximum ON Time (sec) when pulsed continuously ¹	∞	100	36	10	3.5
	Watts (@ 20°C)	21	42	84	210	420
	Ampere Turns (@ 20°C)	890	1250	1760	2800	3987
	Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)
	523	2.01	294	6.1	8.5	12.0
	524	3.15	364	7.7	10.8	15.2
	525	4.88	448	9.7	13.6	19.2
	526	7.72	564	12.2	17.1	24.0
	527	10.90	648	15.0	21.0	30.0
	528	18.20	836	19.4	27.0	38.0
	529	30.40	1105	25.0	34.0	48.0
	530	42.50	1248	30.0	43.0	60.0
	531	69.00	1590	39.0	54.0	76.0
	532	107.00	2006	48.0	67.0	94.0
	533	169.00	2470	61.0	86.0	120.0

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available – please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.
 * Please enquire for sizes and strokes not shown.

5S

Rotary Solenoids

Rotary

5S

Dimensions (mm)	∅ 48 x 27
Duty cycle	continuous or intermittent
Operation	clockwise or anti clockwise
Life	1 million cycles
Power (W)	21–420
Supply (V)	6.1–271 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility: on/off operation



Technical Data

Dielectric Strength	23 awg (wire diameter), 1000 VRMS; 24–33 awg (wire diameter), 1200 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 190,5 x 190,5 x 3,2 mm
Coil Resistance	±5% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	28,2 mNm ±20%
Weight	255,2 g

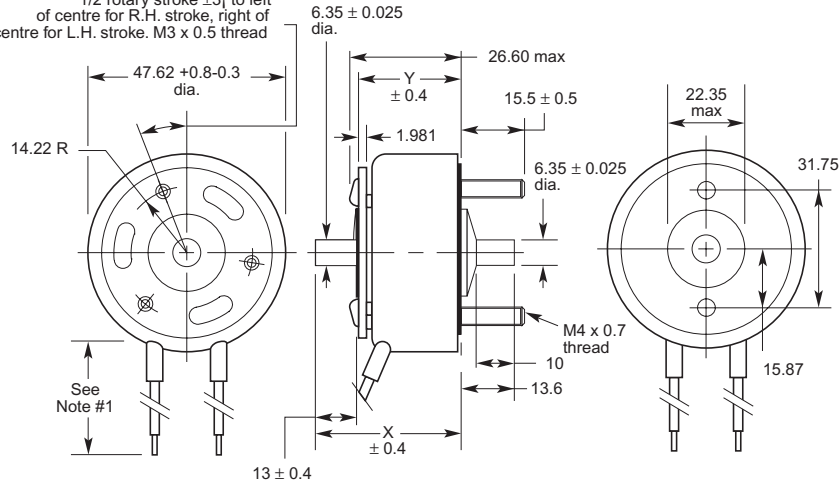
Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
M-3397-023	∅ 48 X 27 mm	8,6 VDC	50%	45°	1,1 mm	42 W @20°C	0,47 Nm	100 sec	Clockwise

5S

Dimensions

3 holes equally spaced located
 1/2 rotary stroke $\pm 3j$ to left
 of centre for R.H. stroke, right of
 centre for L.H. stroke. M3 x 0.5 thread



"X" DIMENSION	--- - 25°	= 37.5
	35° & 45°	= 37.6
	67-1/2°	= 37.7
	95°	= 37.8
"Y" DIMENSION	--- - 25°	= 23.65
	35° & 45°	= 23.72
	67-1/2°	= 23.85
	95°	= 23.98

5S

Ordering Reference

Type	M-2414-(0XX)	Stroke 25° CW	M-15335-(0XX)	Stroke 55° CW	M-1155-(0XX)	Stroke 95° CW
	M-2708-(0XX)	Stroke 25° CCW	M-15336-(0XX)	Stroke 55° CCW	M-1154-(0XX)	Stroke 95° CCW
	M-2875-(0XX)	Stroke 35° CW	M-3399-(0XX)	Stroke 67,5° CW	M-15338-(0XX)	Stroke 110° CW
	M-2016-(0XX)	Stroke 35° CCW	M-3400-(0XX)	Stroke 67,5° CCW	M-15339-(0XX)	Stroke 110° CCW
	M-3397-(0XX)	Stroke 45° CW	M-15337-(0XX)	Stroke 75° CW		
	M-2845-(0XX)	Stroke 45° CCW				

Performance Specifications		100%	50%	25%	10%	5%
Stroke 25°	Available Torque ⁵ (Nm)	0.22	0.47	0.84	1.39	1.52
	Energising Time (msec)	18.6	14.3	11.5	9.0	7.2
Stroke 35°	Available Torque ⁵ (Nm)	0.14	0.30	0.52	0.90	1.06
	Energising Time (msec)	*	*	*	*	*
Stroke 45°	Available Torque ⁵ (Nm)	0.08	0.20	0.39	0.72	0.79
	Energising Time (msec)	28.1	20.3	15.6	12.0	10.0
Stroke 55°	Available Torque ⁵ (Nm)	*	*	*	*	*
	Energising Time (msec)	*	*	*	*	*
Stroke 67,5°	Available Torque ⁵ (Nm)	0.06	0.14	0.25	0.44	0.55
	Energising Time (msec)	*	*	*	*	*
Stroke 75°	Available Torque ⁵ (Nm)	*	*	*	*	*
	Energising Time (msec)	*	*	*	*	*
Stroke 95°	Available Torque ⁵ (Nm)	0.02	0.06	0.11	0.21	0.29
	Energising Time (msec)	62.4	36.5	26.1	18.7	15.0
Stroke 110°	Available Torque ⁵ (Nm)	*	*	*	*	*
	Energising Time (msec)	*	*	*	*	*

Coil Performance	Maximum ON Time (sec) when pulsed continuously ¹	∞	100	36	10	3.5
	Watts (@ 20°C)	21	42	84	210	420
	Ampere Turns (@ 20°C)	860	1220	1720	2730	3853

Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	2.03	288	6.1	8.6	12.1	19.2	27.0
	024	3.20	360	7.6	10.8	15.3	24.0	34.0
	025	4.91	440	9.6	13.6	19.2	31.0	43.0
	026	7.72	550	12.1	17.1	24.0	38.0	54.0
	027	11.12	636	15.0	21.0	30.0	48.0	67.0
	028	18.79	840	19.2	27.0	39.0	61.0	86.0
	029	30.48	1088	24.0	34.0	48.0	77.0	108.0
	030	44.86	1275	30.0	43.0	61.0	96.0	136.0
	031	70.90	1596	38.0	54.0	76.0	121.0	171.0
	032	109.00	1974	47.0	67.0	95.0	150.0	212.0
	033	175.00	2496	60.0	86.0	121.0	192.0	271.0

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available – please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.
 * Please enquire for sizes and strokes not shown.

6S

Rotary Solenoids

Rotary

6S

Dimensions (mm)	∅ 57 x 34
Duty cycle	continuous or intermittent
Operation	clockwise or anti clockwise
Life	1 million cycles
Power (W)	32–640
Supply (V)	10.3–469 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility; on/off operation



Technical Data

Dielectric Strength	23-31 awg (wire diameter), 1200 VRMS; 32-33 awg (wire diameter), 1500 VRM
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 314,3 x 314,3 x 3,2 mm
Coil Resistance	±5% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	56,5 mNm ±20%
Weight	510,3 g

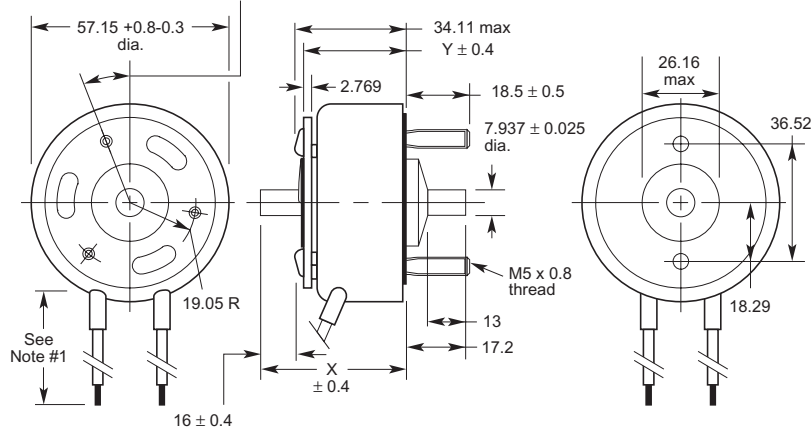
Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
M-15064-023	∅ 57 X 34 mm	14,6 VDC	50%	45°	1,4 mm	64 W @20°C	1,02 Nm	87 sec	Clockwise

65

Dimensions

3 holes equally spaced located
 1/2 rotary stroke $\pm 3j$ to left
 of centre for R.H. stroke, right of
 centre for L.H. stroke. M4 x 0.7 thread



"X" DIMENSION - - - 25° = 47.78
 35° = 47.83
 45°, 67-1/2°, & 95° = 47.90

"Y" DIMENSION - - - 25° = 31.01
 35° = 31.06
 45°, 67-1/2°, & 95° = 31.14

6S

Ordering Reference

Type	M-15067-(0XX)	Stroke 25° CW	M-15426-(0XX)	Stroke 67.5° CW
	M-15123-(0XX)	Stroke 25° CCW	M-15427-(0XX)	Stroke 67.5° CCW
	M-2057-(0XX)	Stroke 35° CW	M-2001-(0XX)	Stroke 95° CW
	M-15136-(0XX)	Stroke 35° CCW	M-15030-(0XX)	Stroke 95° CCW
	M-15064-(0XX)	Stroke 45° CW	M-15428-(0XX)	Stroke 110° CW
	M-15424-(0XX)	Stroke 45° CCW	M-15429-(0XX)	Stroke 110° CCW
	M-15425-(0XX)	Stroke 55° CW		

Performance Specifications		100%	50%	25%	10%	5%
Stroke 25°	Available Torque ⁵ (Nm)	0.53	1.02	1.86	3.20	3.52
	Energising Time (msec)	24.1	18.6	14.8	11.4	9.5
Stroke 35°	Available Torque ⁵ (Nm)	0.39	0.75	1.38	2.14	2.36
	Energising Time (msec)	*	*	*	*	*
Stroke 45°	Available Torque ⁵ (Nm)	0.20	0.40	0.75	1.27	1.39
	Energising Time (msec)	38.1	27.4	21.6	16.5	13.5
Stroke 55°	Available Torque ⁵ (Nm)	*	*	*	*	*
	Energising Time (msec)	*	*	*	*	*
Stroke 67.5°	Available Torque ⁵ (Nm)	0.18	0.35	0.63	0.99	1.01
	Energising Time (msec)	*	*	*	*	*
Stroke 95°	Available Torque ⁵ (Nm)	0.10	0.19	0.37	0.58	0.64
	Energising Time (msec)	*	*	*	*	*
Stroke 110°	Available Torque ⁵ (Nm)	*	*	*	*	*
	Energising Time (msec)	*	*	*	*	*

Coil Performance		∞	87	36	13	4.6
Maximum ON Time (sec) when pulsed continuously ¹						
Watts (@ 20°C)		32	64	128	320	640
Ampere Turns (@ 20°C)		1240	1760	2490	3920	5555

Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
023		3.59	432	10.3	14.6	21.0	33.0	46.0
024		5.24	500	13.0	18.4	26.0	41.0	58.0
025		9.51	708	16.7	24.0	33.0	53.0	75.0
026		14.44	858	21.0	30.0	42.0	66.0	94.0
027		23.69	1110	27.0	38.0	53.0	84.0	119.0
028		38.27	1411	34.0	48.0	68.0	106.0	151.0
029		54.62	1638	41.0	59.0	83.0	131.0	185.0
030		93.67	2184	53.0	76.0	107.0	168.0	238.0
031		143.00	2645	67.0	95.0	134.0	211.0	299.0
032		223.00	3328	83.0	118.0	167.0	262.0	372.0
033		338.00	4004	105.0	149.0	210.0	331.0	469.0

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available – please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.
 * Please enquire for sizes and strokes not shown.

7S

Rotary Solenoids

Rotary

7S

Dimensions (mm)	∅ 70 x 45
Duty cycle	continuous or intermittent
Operation	clockwise or anti clockwise
Life	1 million cycles
Power (W)	35–700
Supply (V)	16.3–463 VDC
Power	Average power consumption; high torque output
Housing	Compact design with a variety of mounting and shaft end configurations
Functional Advantages	Most diversified rotary design for maximum versatility; on/off operation



Technical Data

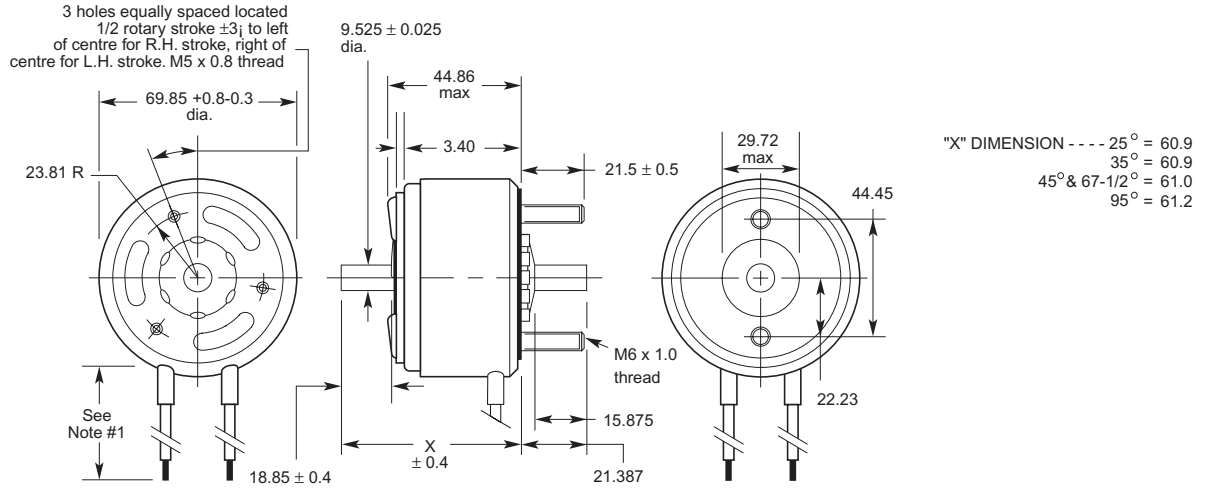
Dielectric Strength	23-29 awg (wire diameter), 1200 VRMS; 30-33 awg (wire diameter), 1500 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 384,2 x 384,2 x 3,2 mm
Coil Resistance	23-30 awg (wire diameter), ±5% tolerance; 31-33 awg (wire diameter), ±10% tolerance
Starting Torque	Gross torque values are shown. For net starting torque, subtract return spring torque
Return Spring Torque	84,8 mNm ±20%
Weight	1,02 kg

Preferred Range

Type	Size	Rated voltage	Duty Cycle	Rotary Stroke (Angle°)	Nom Axial Stroke	Nominal power	Available torque	Max. "On time"	Rotation
M-15614-023	∅ 70 X 45 mm	23 VDC	50%	55°	1,9 mm	70 W @20°C	1,7 Nm	80 sec	Clockwise

7S

Dimensions



7S

Ordering Reference

Type	M-2415-(0XX)	Stroke 25° CW	M-15614-(0XX)	Stroke 55° CW
	M-15116-(0XX)	Stroke 25° CCW	M-15504-(0XX)	Stroke 67.5° CW
	M-15134-(0XX)	Stroke 35° CW	M-15505-(0XX)	Stroke 67.5° CW
	M-15137-(0XX)	Stroke 35° CCW	M-3037-(0XX)	Stroke 95° CW
	M-15502-(0XX)	Stroke 45° CW	M-15506-(0XX)	Stroke 95° CW
	M-15503-(0XX)	Stroke 45° CCW		

Performance Specifications		100%	50%	25%	10%	5%	
Stroke 25°	Available Torque ⁵ (Nm)	1.27	2.74	3.82	4.88	5.36	
	Energising Time (msec)	32.3	25.1	20.3	15.6	13.2	
Stroke 35°	Available Torque ⁵ (Nm)	0.69	1.38	2.53	4.37	4.83	
	Energising Time (msec)	*	*	*	*	*	
Stroke 45°	Available Torque ⁵ (Nm)	0.58	1.01	1.89	3.43	3.77	
	Energising Time (msec)	45.1	33.9	27.2	20.2	16.9	
Stroke 55°	Available Torque ⁵ (Nm)	*	*	*	*	*	
	Energising Time (msec)	*	*	*	*	*	
Stroke 67.5°	Available Torque ⁵ (Nm)	0.28	0.58	1.11	1.98	2.18	
	Energising Time (msec)	*	*	*	*	*	
Stroke 95°	Available Torque ⁵ (Nm)	0.17	0.39	0.72	1.18	1.31	
	Energising Time (msec)	81.6	58.8	44.8	33.0	27.3	
Coil Performance	Maximum ON Time (sec) when pulsed continuously ¹	∞	80	38	16	5.7	
	Watts (@ 20°C)	35	70	140	350	700	
	Ampere Turns (@ 20°C)	1570	2230	3150	5000	7034	
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	8.09	780	16.3	23.0	33.0	52.0
	024	12.34	949	21.0	29.0	41.0	65.0
	025	18.62	1148	26.0	37.0	52.0	83.0
	026	30.84	1472	33.0	47.0	66.0	105.0
	027	48.77	1854	41.0	59.0	83.0	132.0
	028	81.14	2436	52.0	74.0	105.0	167.0
	029	121.0	2944	65.0	92.0	130.0	206.0
	030	190.0	3650	82.0	116.0	164.0	261.0
	031	275.0	4175	103.0	147.0	208.0	329.0
	032	440.0	5292	130.0	169.0	239.0	380.0
	033	715.0	6650	158.0	223.0	316.0	—

¹ Continuously pulsed at stated watts and duty cycle
² Typical energise time based on no load condition. Times shown are for half of full rotary stroke starting at centre-off position.
³ Other coil awg (wire diameter) sizes available – please enquire
⁴ Reference number of turns
⁵ Holding torque is shown at the stabilised temperature of 105°C and continuous duty.

All data is at 20°C coil temperature. Torque outputs degrade with increased temperatures.
 * Please enquire for sizes and strokes not shown.



Linear Solenoids

Soft Shift®	Type	Preferred Products	Page
	2 EPM	196655-030	76
	3 EPM	196656-028	79
	4 EPM	196657-026	82
	5 EPM	196658-024	85
	6 EPM	196659-023	88

2EPM

Linear Solenoids

Soft Shift®

2EPM

Dimensions (mm)	∅ 29 x 25
Duty cycle	continuous or intermittent
Stroke	Up to 4.1 mm
Operation	Quiet operation with 3-5 times the starting force of standard solenoids
Max. force (N)	Up to 16.9 N (@10% Duty cycle)
Life	1 million cycles
Power (W)	7-70
Supply(V)	2.2-91 VDC
Power	Average power consumption; moderate force output
Functional Advantages	Slow, smooth motion or snap action; can provide closed loop velocity and position control



Technical Data

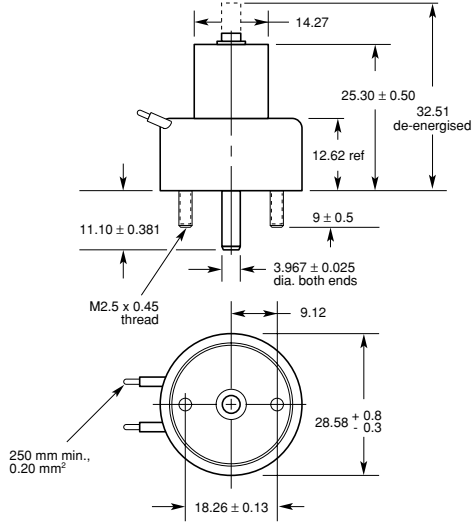
Stroke	4.06 ± 0.762 mm
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated are based on an unrestricted flow of air at 20°C, mounted on the equivalent of an aluminium plate measuring 85.7 x 85.7 x 3.2 mm
Coil Resistance	±5% tolerance on all coil awg (wire diameter)
Spring Rate	123.2 Nmm; 0.6 N ±30% preload reference
Weight	70.9 g

Preferred Range

Type	Size	Max. Stroke	Duty Cycle	Nominal voltage	Force	Nominal power	max. "On time"
196655-030	∅ 29 X 25 mm	4.1 Nm	100%	8.8 VDC	4.5 N	7 W @20°C	∞ sec

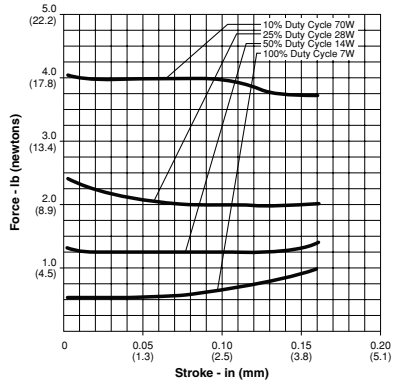
2EPM

Dimensions

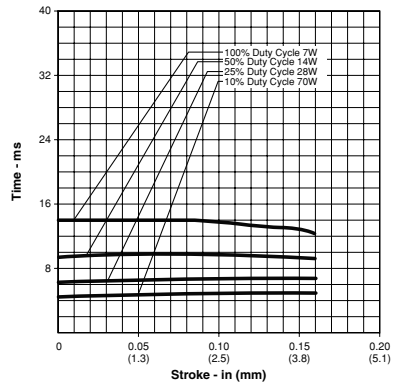


Performance chart

Typical Force @20°C



Typical Speed @ No Load, 20°C



2EPM

Ordering Reference

Type	196655-(0XX)		100%	50%	25%	10%	
Performance	Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	7	
	Maximum Stroke mm ± 0.03		4.1	4.1	4.1	4.1	
	Force (N) @ Maximum Stroke and Specified Duty Cycle		4.45	6.23	8.9	16.9	
	Watts (@ 20°C)		7	14	28	70	
	Ampere Turns (@ 20°C)		425	602	849	1350	
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	024	0.68	130	2.2	3.2	4.5	7.1
	025	1.16	174	2.8	4.0	5.7	9.0
	026	1.96	231	3.6	5.1	7.2	11.5
	027	3.16	296	4.5	6.4	9.0	14.4
	028	5.10	378	5.7	8.1	11.5	18.2
	029	6.94	423	7.0	9.9	13.9	22.0
	030	11.03	530	8.8	12.5	17.7	28.0
	031	16.85	649	11.0	15.6	22.0	35.0
	032	28.15	858	13.9	19.8	28.0	44.0
	033	42.75	1036	17.5	25.0	35.0	56.0
	034	69.56	1312	23.0	32.0	45.0	72.0
	035	112.00	1674	29.0	40.0	57.0	91.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

3EPM

Linear Solenoids

Soft Shift®

3EPM

Dimensions (mm)	∅ 33 x 31
Duty cycle	continuous or intermittent
Stroke	6,4 mm
Operation	Quiet operation with 3-5 times the starting force of standard solenoids
Max. force (N)	19,1 N (@10% Duty cycle)
Life	1 million cycles
Power (W)	9-90
Supply (V)	2,6-83 VDC
Power	Average power consumption; moderate force output
Functional Advantages	Slow, smooth motion or snap action; can provide closed loop velocity and position control



Technical Data

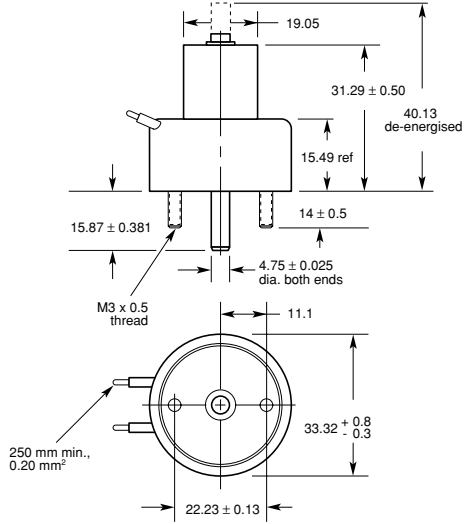
Stroke	6,35 ± 0,762 mm
Dielectric Strength	1000 VRMS (23-27 awg) (wire diameter); 1200 VRMS (28-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 117,5 x 117,5 x 3,2 mm
Coil Resistance	±5% tolerance on all coil awg (wire diameter)
Spring Rate	82,5 Nmm; 1,0 N ±30% preload reference
Weight	113,4 g

Preferred Range

Type	Size	Max. Stroke	Duty Cycle	Nominal voltage	Force	Nominal power	max. "On time"
196656-028	∅ 33 X 31 mm	6,4 Nm	100%	8,4 VDC	4,5 N	9 W @20°C	∞ sec

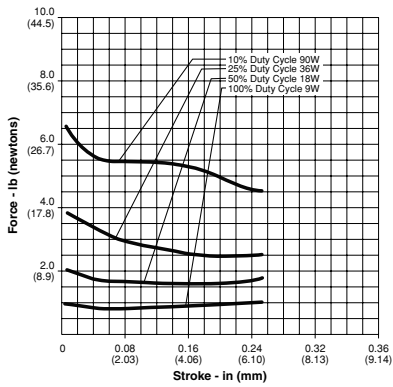
3EPM

Dimensions

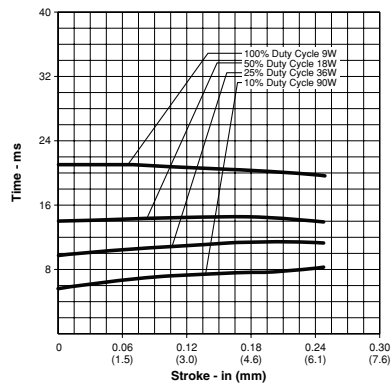


Performance chart

Typical Force @20°C



Typical Speed @ No Load, 20°C



3EPM

Ordering Reference

Type	196656-(OXX)						
		100%	50%	25%	10%		
Performance	Maximum ON Time (sec) when pulsed continuously ¹	∞	100	36	8		
	Maximum Stroke mm ± 0.03	6.4					
	Force (N) @ Maximum Stroke and Specified Duty Cycle	4.45	8.46	10.25	19.14		
	Watts (@ 20°C)	9	18	36	90		
	Ampere Turns (@ 20°C)	535	756	1070	1690		
Coil Data	awg (OXX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	0.70	145	2.6	3.7	5.2	8.2
	024	1.18	192	3.3	4.6	6.6	10.4
	025	1.97	252	4.2	5.9	8.4	13.2
	026	3.26	328	5.3	7.5	10.6	16.8
	027	5.04	405	6.7	9.4	13.3	21.0
	028	8.02	510	8.4	11.9	16.8	27.0
	029	12.21	627	10.4	14.7	21.0	33.0
	030	19.20	780	13.2	18.6	26.0	42.0
	031	31.84	1008	16.9	24.0	34.0	53.0
	032	46.97	1215	21.0	29.0	41.0	65.0
	033	75.30	1530	26.0	37.0	53.0	83.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

4EPM

Linear Solenoids

Soft Shift®

4EPM

Dimensions (mm)	∅ 40 x 37
Duty cycle	continuous or intermittent
Stroke	Up to 7,6 mm
Operation	Quiet operation with 3-5 times the starting force of standard solenoids
Max. force (N)	Up to 33,4 N (@ 10% Duty cycle)
Life	1 million cycles
Power (W)	12,5–125
Supply (V)	4,3–132 VDC
Power	Average power consumption; moderate force output
Functional Advantages	Slow, smooth motion or snap action; can provide closed loop velocity and position control



Technical Data

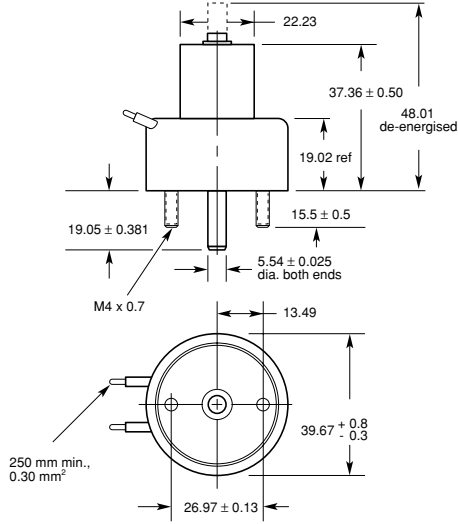
Stroke	7.62 ± 0.762 mm
Dielectric Strength	1000 VRMS (23-24 awg) (wire diameter); 1200 VRMS (25-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 158,8 x 158,8 x 3,2 mm
Coil Resistance	±5% tolerance on all coil awg (wire diameter)
Spring Rate	159,3 Nmm; 1,6 N ±30% preload reference
Weight	198,4 g

Preferred Range

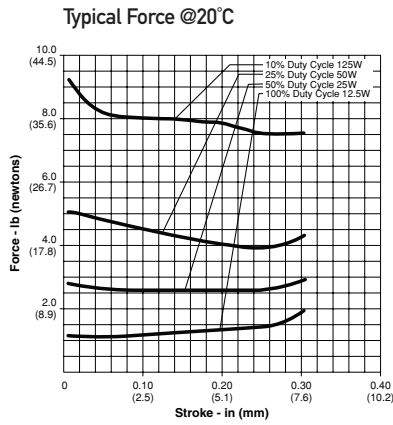
Type	Size	Max. Stroke	Duty Cycle	Nominal voltage	Force	Nominal power	max. "On time"
196657-026	∅ 40 X 37 mm	7,6 Nm	100%	8,3 VDC	8,9 N	12,5 W @20°C	∞ sec

4EPM

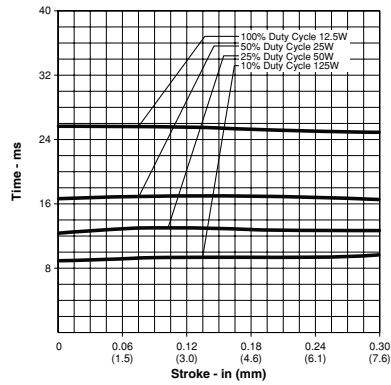
Dimensions



Performance chart



Typical Speed @ No Load, 20°C



4EPM

Ordering Reference

Type	196657-(0XX)						
Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	9		
Maximum Stroke mm ± 0.03		7.6					
Force (N) @ Maximum Stroke and Specified Duty Cycle		8.9	13.35	19.14	33.38		
Watts (@ 20°C)		12.5	25	50	125		
Ampere Turns (@ 20°C)		714	1000	1425	2250		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	1.59	266	4.3	6.0	8.5	13.4
	024	2.20	301	5.2	7.3	10.4	16.4
	025	3.54	384	6.6	9.2	13.1	21.0
	026	5.67	486	8.3	11.7	16.6	26.0
	027	8.76	600	10.4	14.6	21.0	33.0
	028	13.80	748	13.2	18.5	26.0	42.0
	029	22.60	975	16.6	23.0	33.0	52.0
	030	34.80	1190	21.0	29.0	42.0	66.0
	031	56.70	1520	27.0	37.0	53.0	84.0
	032	88.30	1908	33.0	46.0	66.0	104.0
	033	138.00	2360	42.0	59.0	83.0	132.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

5EPM

Linear Solenoids

Soft Shift®

5EPM

Dimensions (mm)	∅ 48 x 49
Duty cycle	continuous or intermittent
Stroke	Up to 10,3 mm
Operation	Quiet operation with 3-5 times the starting force of standard solenoids
Max. force (N)	Up to 55,6 N (@ 10% Duty cycle)
Life	1 million cycles
Power (W)	21–210
Supply (V)	7,2–226 VDC
Power	Average power consumption; moderate force output
Functional Advantages	Slow, smooth motion or snap action; can provide closed loop velocity and position control



Technical Data

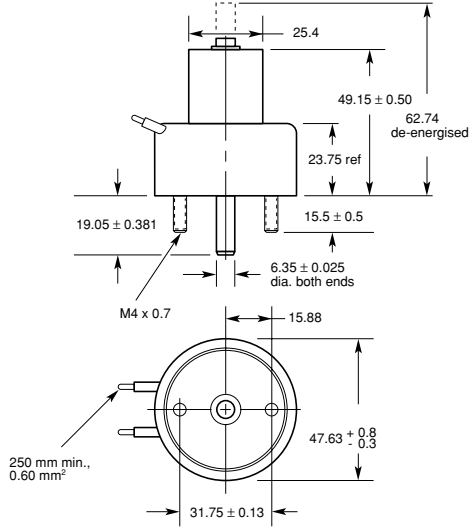
Stroke	10.16 ± 0.762 mm
Dielectric Strength	1000 VRMS (23 awg) (wire diameter); 1200 VRMS (24-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 190,5 x 190,5 x 3,2 mm
Coil Resistance	±5% tolerance on all coil awg (wire diameter)
Spring Rate	498,3 Nmm; 2,0 N ±30% preload reference
Weight	340,2 g

Preferred Range

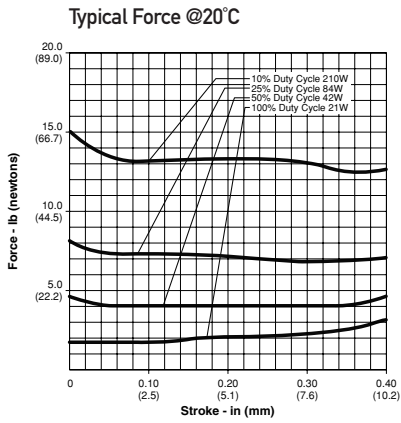
Type	Size	Max. Stroke	Duty Cycle	Nominal voltage	Force	Nominal power	max. "On time"
196658-028	∅ 48 X 49 mm	10,2 Nm	100%	9 VDC	11,4 N	21 W @20°C	∞ sec

5EPM

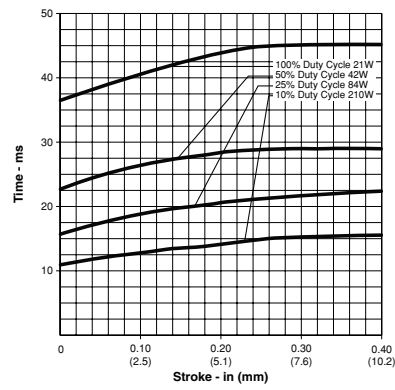
Dimensions



Performance chart



Typical Speed @ No Load, 20°C



5EPM

Ordering Reference

Type	196658-(0XX)						
		100%	50%	25%	10%		
Performance	Maximum ON Time (sec) when pulsed continuously ¹	∞	100	36	10		
	Maximum Stroke mm ± 0.03	10.2					
	Force (N) @ Maximum Stroke and Specified Duty Cycle	13.35	20.02	31.15	55.62		
	Watts (@ 20°C)	21	42	84	210		
	Ampere Turns (@ 20°C)	1015	1440	2030	3210		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	2.70	384	7.2	10.1	14.3	23.0
	024	4.30	486	9.0	12.7	18.0	28.0
	025	6.66	590	11.5	16.2	23.0	36.0
	026	10.30	737	14.0	20.0	28.0	44.0
	027	15.70	900	17.7	25.0	35.0	56.0
	028	26.60	1190	23.0	32.0	45.0	72.0
	029	38.00	1380	28.0	40.0	56.0	89.0
	030	62.10	1768	36.0	51.0	71.0	113.0
	031	96.10	2166	45.0	64.0	90.0	143.0
	032	157.00	2816	57.0	80.0	113.0	179.0
	033	241.00	3432	71.0	101.0	143.0	226.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

6 EPM

Linear Solenoids

Soft Shift®

6EP

Dimensions (mm)	∅ 57 x 56
Duty cycle	continuous or intermittent
Stroke	Up to 10,7 mm
Operation	Quiet operation with 3-5 times the starting force of standard solenoids
Max. force (N)	Up to 131,3 N (@ 10% Duty cycle)
Life	1 million cycles
Power (W)	32-320
Supply (V)	12,3-394 VDC
Power	Average power consumption; moderate force output
Functional Advantages	Slow, smooth motion or snap action; can provide closed loop velocity and position control



Technical Data

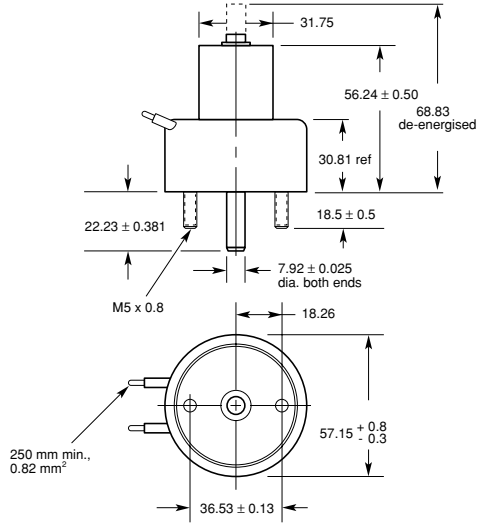
Stroke	10,67 ± 0,762 mm
Dielectric Strength	1200 VRMS (23-31 awg) (wire diameter); 1500 VRMS (32-33 awg) (wire diameter)
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 314,3 x 314,3 x 3,2 mm
Coil Resistance	±5% tolerance on all coil awg (wire diameter)
Spring Rate	535,6 Nmm; 4,8 N ±30% preload reference
Weight	652 g

Preferred Range

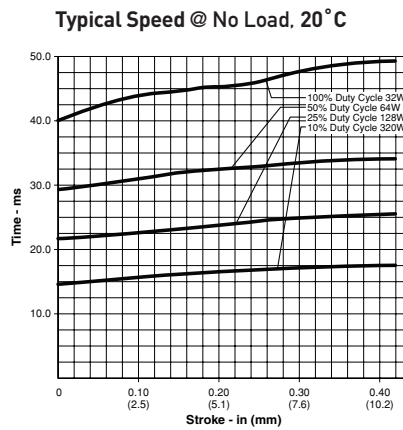
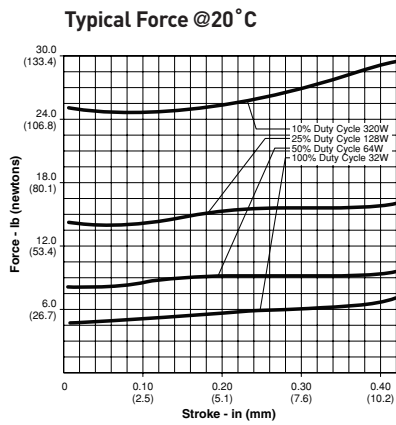
Type	Size	Max. Stroke	Duty Cycle	Nominal voltage	Force	Nominal power	max. "On time"
196659-023	∅ 57 X 56 mm	10,7 Nm	100%	12,3 VDC	31,1 N	32 W @20°C	∞ sec

6EPM

Dimensions



Performance chart



6EPM

Ordering Reference

Type	196659-(OXX)		100%	50%	25%	10%	
Performance	Maximum ON Time (sec) when pulsed continuously ¹		∞	87	36	13	
	Maximum Stroke mm ± 0.03		10.7				
	Force (N) @ Maximum Stroke and Specified Duty Cycle		31.1	42.7	71.2	131.3	
	Watts (@ 20°C)		32	64	128	320	
	Ampere Turns (@ 20°C)		1480	2080	2940	4620	
Coil Data	awg (OXX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	4.69	567	12.3	17.2	24.0	38.0
	024	7.43	710	15.5	22.0	31.0	48.0
	025	12.90	960	19.9	28.0	39.0	62.0
	026	19.70	1170	25.0	35.0	49.0	78.0
	027	32.00	1500	32.0	44.0	63.0	99.0
	028	51.60	1904	40.0	56.0	79.0	125.0
	029	74.40	2232	49.0	69.0	98.0	154.0
	030	126.00	2940	63.0	89.0	126.0	198.0
	031	195.00	3611	80.0	112.0	159.0	250.0
	032	288.00	4350	98.0	138.0	195.0	306.0
	033	427.00	5010	126.0	177.0	251.0	394.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

Linear Solenoids

Tubular	Type	Preferred Products	Page
	STA Pull 13 x 27 mm STA Pull 13 x 27 mm	195222-232 195222-132	94
	STA Push 13 x 27 mm STA Push 13 x 27 mm	195223-232 195223-132	97
	STA Pull 20 x 39 mm STA Pull 20 x 39 mm	195224-229 195224-129	100
	STA Push 20 x 39 mm STA Push 20 x 39 mm	195225-229 195225-129	103
	STA Pull 26 x 52 mm STA Pull 26 x 52 mm	195224-229 195224-129	106
	STA Push 26 x 52 mm STA Push 26 x 52 mm	195225-229 195225-129	109
	STA 125 M Pull 32 x 57 mm	282366-024	112
	STA 150 M Pull 38 x 63 mm	282367-023	115

STA 13 x 27

Linear Solenoid

Tubular – Pull

STA 13 x 27

Dimensions (mm)	∅ 13 x 27
Duty cycle	continuous or intermittent
Stroke	Nominal Stroke 2.5 mm
Operation	Pull engagement; well-suited to lock/latch operations
Max. force (N)	Up to 4,45 N (@ 10% Duty Cycle)
Life	Extraordinary life of 25+ million actuations
Power (W)	4–40
Supply (V)	2,4–77 VDC
Functional Advantages	Economical STA® Series design for volume applications; multiple plunger designs; on/off operation



Technical Data

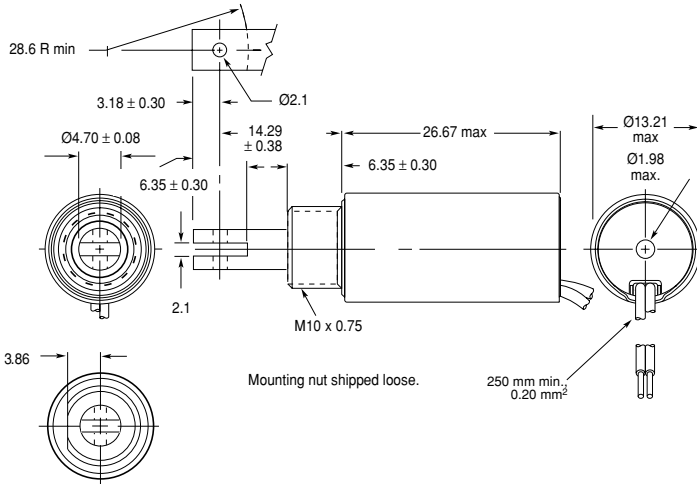
Dielectric Strength	500 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 51 x 3.2 mm
Coil Resistance	±5% tolerance
Holding Force	Flat Face: 5,25 N @20°C 60°: 4,00 N @20°C
Weight	24,7 g
Plunger Weight	4,54 g

Preferred Range

Type	Size	Function	Duty Cycle	Max. Stroke	Nominal voltage	Force@Nominal Stroke	Nominal power	max. "On time"
195222-232	∅ 13 X 27 mm	Pull	100%	12,7 mm	8,1 VDC	0,6–0,8 N	4 W @20°C	∞ sec
195222-132	∅ 13 X 27 mm	Pull	100%	12,7 mm	8,1 VDC	0,6–0,8 N	4 W @20°C	∞ sec

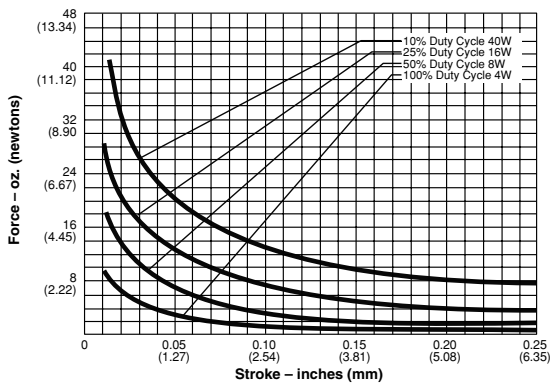
STA Series Pull 13 x 27

Dimensions

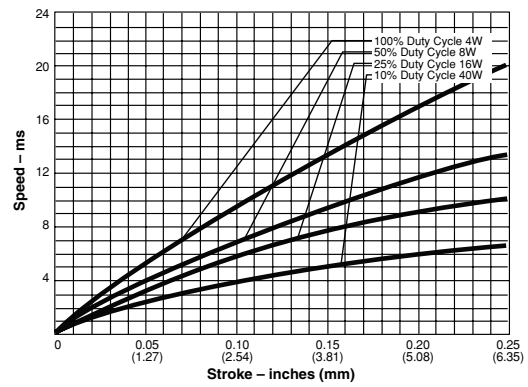


Performance chart

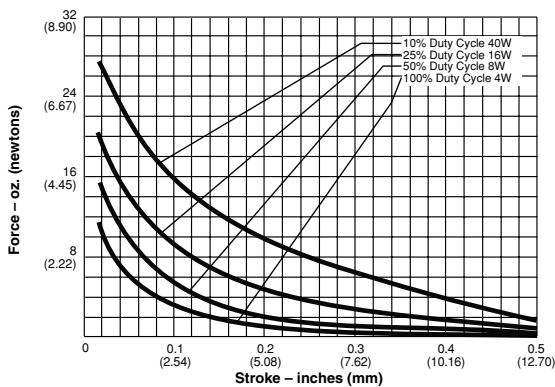
Flat face Plunger, Force



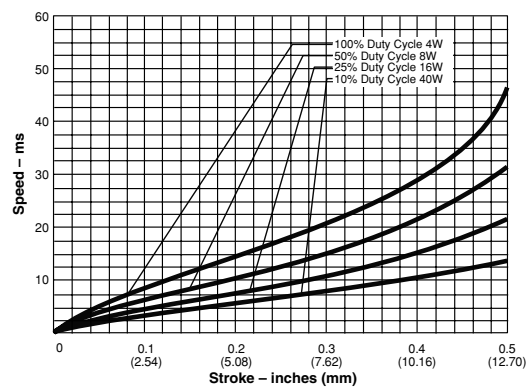
Flat face Plunger, Speed



60° Plunger, Force



60° Plunger, Speed



STA Series Pull 13 x 27

Ordering Reference

Type 195222-(0) Plunger (XX) Coil Data awg (wire diameter)

Plunger Configurations and anti-rotation flat on mounting

- 1 Flat face plunger without anti-rotation flat
- 2 60° plunger without anti-rotation flat
- 5 Flat face plunger with anti-rotation flat
- 6 60° plunger with anti-rotation flat

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	50	5	2		
Force@Nominal Stroke (N)		0.6– 0.8	1.1– 1.4	2.0– 2.5	3.6– 4.5		
Watts (@20°C)		4	8	16	40		
Ampere Turns (@20°C)		497	704	994	1573		
Coil Data	awg (XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	27	1.43	306	2.4	3.4	4.8	7.6
	28	1.95	342	2.8	3.9	5.6	8.8
	29	3.84	508	3.9	5.5	7.8	12.4
	30	5.29	572	4.6	6.5	9.2	14.5
	31	9.56	795	6.2	8.8	12.4	19.6
	32	16.54	1068	8.1	11.5	16.3	25.7
	33	22.60	1194	9.5	13.4	19.0	30.0
	34	37.41	1547	12.2	17.3	24.0	39.0
	35	60.71	1976	15.6	22.0	31.0	49.0
	36	96.19	2475	19.6	28.0	39.0	62.0
	37	149.93	3060	24.5	35.0	49.0	77.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

STA 13 x 27

Linear Solenoid

Tubular – Push

STA 13 x 27

Dimensions (mm)	∅ 13 x 27
Duty cycle	continuous or intermittent
Stroke	Nominal Stroke 2.5 mm
Operation	Push engagement; well-suited to lock/latch operations
Max. force (N)	Up to 4,18 N (@ 10% Duty Cycle)
Life	Extraordinary life of 25+ million actuations
Power (W)	4–40
Supply (V)	2,4–77 VDC
Functional Advantages	Economical STA® Series design for volume applications; multiple plunger designs; on/off operation



Technical Data

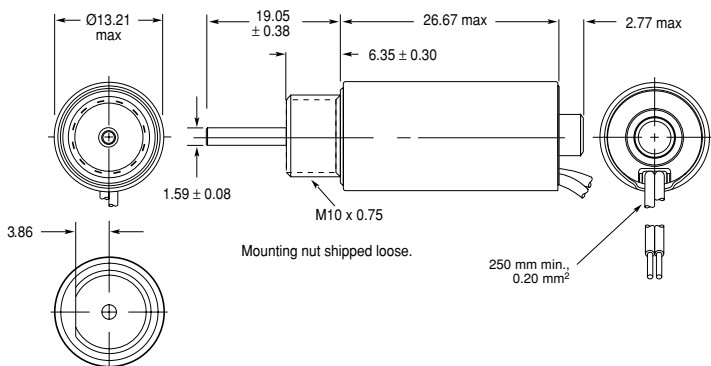
Dielectric Strength	500 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 51 x 3.2 mm
Coil Resistance	±5% tolerance
Holding Force	Flat Face: 4,45 N @20°C 60°: 3,16 N @20°C
Weight	25,2 g
Plunger Weight	3,12 g

Preferred Range

Type	Size	Function	Duty Cycle	Max. Stroke	Nominal voltage	Force@Nominal Stroke	Nominal power	max. "On time"
195223-232	∅ 13 X 27 mm	Push	100%	12,7 mm	8,1 VDC	0,3–0,6 N	4 W @20°C	∞ sec
195223-132	∅ 13 X 27 mm	Push	100%	12,7 mm	8,1 VDC	0,3–0,6 N	4 W @20°C	∞ sec

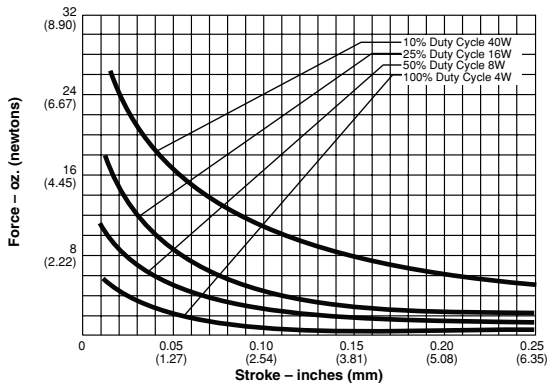
STA Series Push 13 x 27

Dimensions

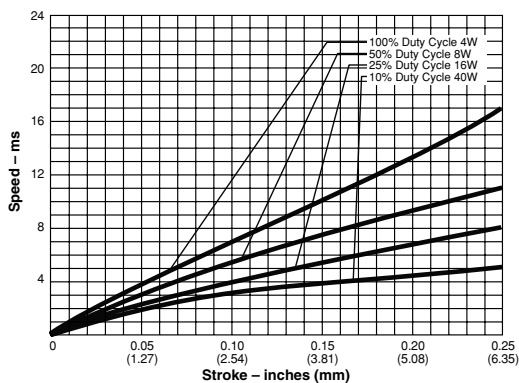


Performance chart

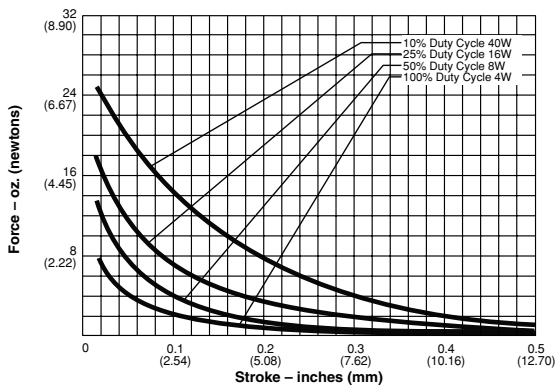
Flat face Plunger, Force



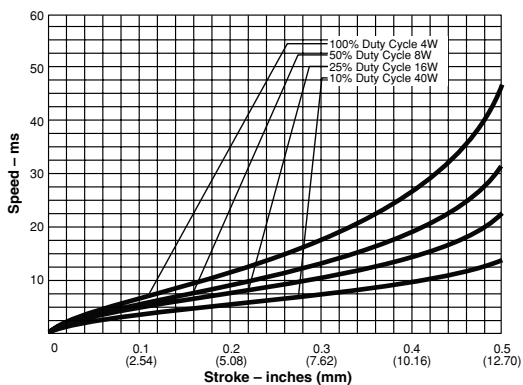
Flat face Plunger, Speed



60° Plunger, Force



60° Plunger, Speed



STA Series Push 13 x 27

Ordering Reference

Type 195223-(0) Plunger (XX) Coil Data awg (wire diameter)

Plunger Configurations and anti-rotation flat on mounting

- 1 Flat face plunger without anti-rotation flat
- 2 60° plunger without anti-rotation flat
- 5 Flat face plunger with anti-rotation flat
- 6 60° plunger with anti-rotation flat

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	50	5	2		
Force@Nominal Stroke (N)		0.27- 0.58	0.62- 1.11	1.38- 2.14	3.07- 4.18		
Watts (@20°C)		4	8	16	40		
Ampere Turns (@20°C)		497	704	994	1573		
Coil Data	awg (XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	27	1.43	306	2.4	3.4	4.8	7.6
	28	1.95	342	2.8	3.9	5.6	8.8
	29	3.84	508	3.9	5.5	7.8	12.4
	30	5.29	572	4.6	6.5	9.2	14.5
	31	9.56	795	6.2	8.8	12.4	19.6
	32	16.54	1068	8.1	11.5	16.3	25.7
	33	22.60	1194	9.5	13.4	19.0	30.0
	34	37.41	1547	12.2	17.3	24.0	39.0
	35	60.71	1976	15.6	22.0	31.0	49.0
	36	96.19	2475	19.6	28.0	39.0	62.0
	37	149.93	3060	24.5	35.0	49.0	77.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

STA 20 x 39

Linear Solenoid

Tubular – Pull

STA 20 x 39

Dimensions (mm)	∅ 20 x 39
Duty cycle	continous or intermittent
Stroke	Nominal Stroke 5.1 mm
Operation	Pull engagement; well-suited to lock/latch operations
Max. force (N)	Up to 11.9 N (@ 10% Duty Cycle)
Life	25 M cycles
Power (W)	7–70
Supply (V)	3.9–76 VDC
Functional Advantages	Economical STA® Series design for volume applications; multiple plunger designs; on/off operation



Technical Data

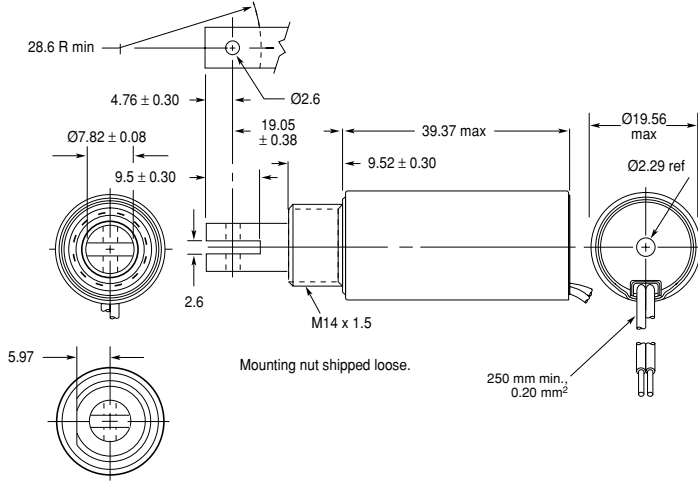
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 3" 1/8"
Coil Resistance	±5% tolerance
Holding Force	Flat Face: 23.31 N @20°C 60°: 12.81 N @20°C
Weight	83.6 g
Plunger Weight	20.13 g

Preferred Range

Type	Size	Function	Duty Cycle	Max. Stroke	Nominal voltage	Force@Nominal Stroke	Nominal power	max. "On time"
195224-229	∅ 20 X 39 mm	Pull	100%	17,8 mm	9,4 VDC	1,7–2,2 N	7 W @20°C	∞ sec
195224-129	∅ 20 X 39 mm	Pull	100%	17,8 mm	9,4 VDC	1,7–2,2 N	7 W @20°C	∞ sec

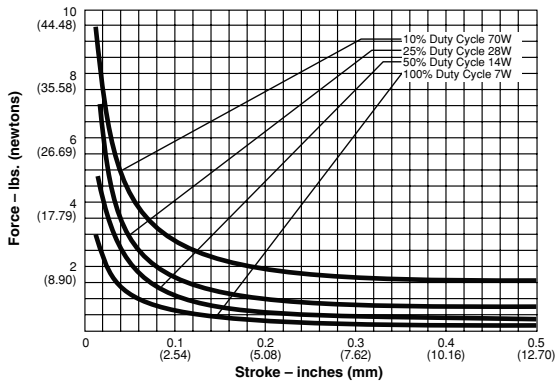
STA Series Pull 20 x 39

Dimensions

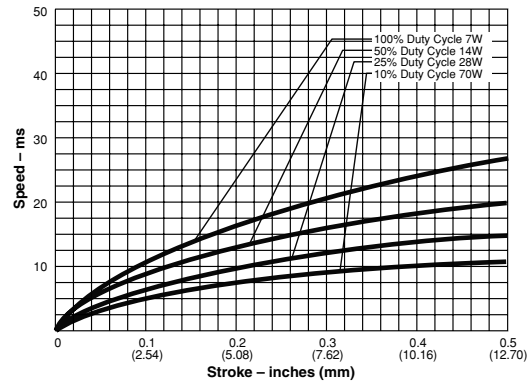


Performance chart

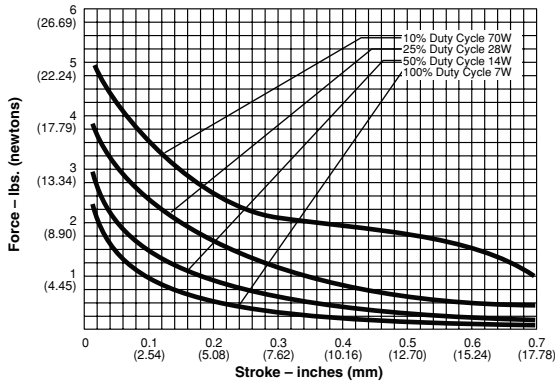
Flat face Plunger, Force



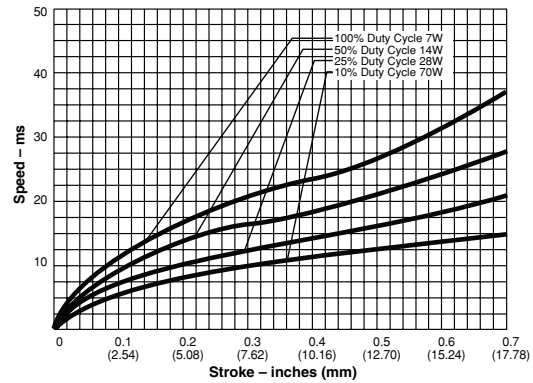
Flat face Plunger, Speed



60° Plunger, Force



60° Plunger, Speed



STA Series Pull 20 x 39

Ordering Reference

Type 195224-(0) Plunger (XX) Coil Data awg (wire diameter)

Plunger Configurations and anti-rotation flat on mounting

- 1 Flat face plunger without anti-rotation flat
- 2 60° plunger without anti-rotation flat
- 5 Flat face plunger with anti-rotation flat
- 6 60° plunger with anti-rotation flat

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	230	25	6		
Force@Nominal Stroke (N)		1.69- 2.22	3.34- 4.45	5.56- 7.25	9.48- 11.97		
Watts (@20°C)		7	14	28	70		
Ampere Turns (@20°C)		855	1200	1700	2700		
Coil Data	awg (XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	25	2.13	488	3.9	5.5	7.7	12.2
	26	2.90	544	4.5	6.4	9.0	14.2
	27	5.27	760	6.1	8.6	12.1	19.2
	28	9.15	1026	8.0	11.3	16.0	25.0
	29	12.50	1146	9.4	13.2	18.7	30.0
	30	20.70	1491	12.0	17.0	24.0	38.0
	31	33.60	1904	15.0	22.0	31.0	48.0
	32	53.50	2394	19.4	27.0	39.0	61.0
	33	83.50	2970	24.0	34.0	48.0	76.0

¹ Continuously pulsed at stated watts and duty cycle

³ Other coil awg (wire diameter) sizes available — please enquire

⁴ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

STA 20 x 39

Linear Solenoid

Tubular – Push

STA 20 x 39

Dimensions (mm)	∅ 20 x 39
Duty cycle	continous or intermittent
Stroke	Nominal Stroke 5.1 mm
Operation	Push engagement; well-suited to lock/latch operations
Max. force (N)	Up to 12.2 N (@ 10% Duty Cycle)
Life	25 M cycles
Power (W)	7–70
Supply (V)	3.9–76 VDC
Functional Advantages	Economical STA® Series design for volume applications; multiple plunger designs; on/off operation



Technical Data

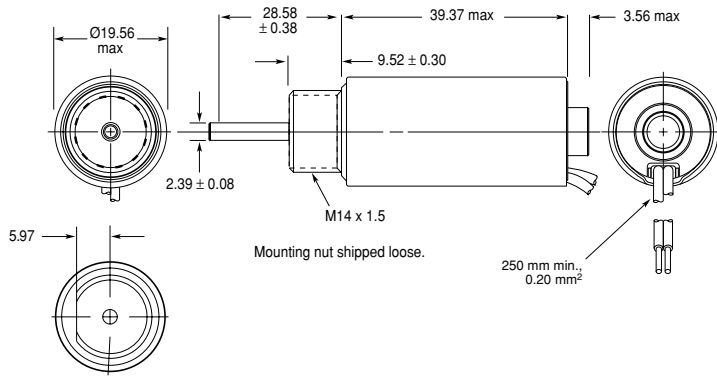
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 76 x 3.2 mm
Coil Resistance	±5% tolerance
Holding Force	Flat Face: 22.02 N @20°C 60°: 12.68 N @20°C
Weight	87.3 g
Plunger Weight	15.03 g

Preferred Range

Type	Size	Function	Duty Cycle	Max. Stroke	Nominal voltage	Force@Nominal Stroke	Nominal power	max. "On time"
195225-229	∅ 20 X 39 mm	Push	100%	17,8 mm	9,4 VDC	1,1–1,7 N	7 W @20°C	∞ sec
195225-129	∅ 20 X 39 mm	Push	100%	17,8 mm	9,4 VDC	1,1–1,7 N	7 W @20°C	∞ sec

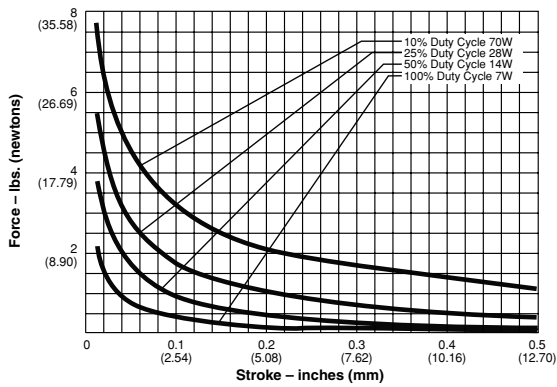
STA Series Push 20 x 39

Dimensions

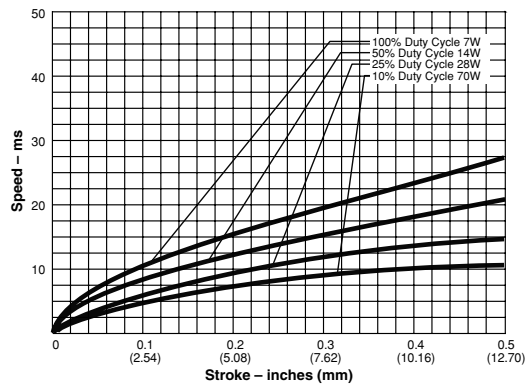


Performance chart

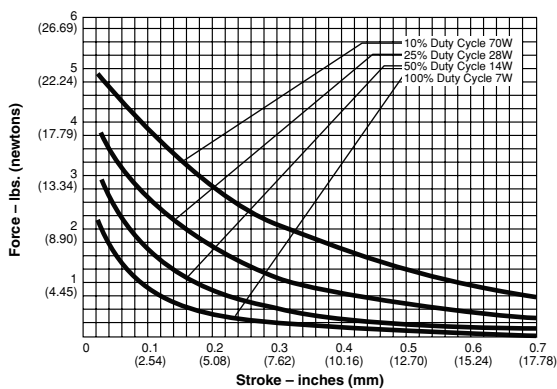
Flat face Plunger, Force



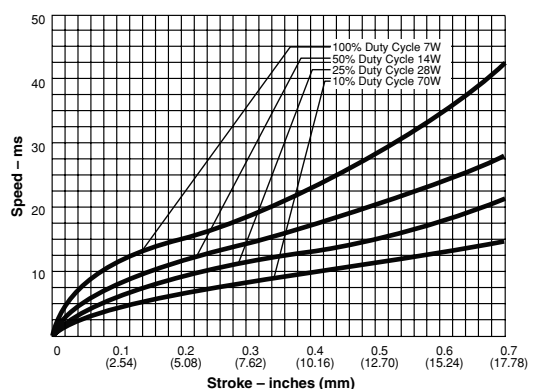
Flat face Plunger, Speed



60° Plunger, Force



60° Plunger, Speed



STA Series Push 20 x 39

Ordering Reference

Type 195225-(0) Plunger (XX) Coil Data awg (wire diameter)

Plunger Configurations and anti-rotation flat on mounting

- 1 Flat face plunger without anti-rotation flat
- 2 60° plunger without anti-rotation flat
- 5 Flat face plunger with anti-rotation flat
- 6 60° plunger with anti-rotation flat

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	230	25	6		
Force@Nominal Stroke (N)		1.11- 1.69	2.22- 3.56	4.90- 6.68	9.79- 12.24		
Watts (@20°C)		7	14	28	70		
Ampere Turns (@20°C)		855	1200	1700	2700		
Coil Data	awg (XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	25	2.13	488	3.9	5.5	7.7	12.2
	26	2.90	544	4.5	6.4	9.0	14.2
	27	5.27	760	6.1	8.6	12.1	19.2
	28	9.15	1026	8.0	11.3	16.0	25.0
	29	12.50	1146	9.4	13.2	18.7	30.0
	30	20.70	1491	12.0	17.0	24.0	38.0
	31	33.60	1904	15.0	22.0	31.0	48.0
	32	53.50	2394	19.4	27.0	39.0	61.0
	33	83.50	2970	24.0	34.0	48.0	76.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

STA 26 x 52

Linear Solenoid

Tubular – Pull

STA 26 x 52

Dimensions (mm)	∅ 26 x 52
Duty cycle	continuous or intermittent
Stroke	Nominal Stroke 7.6 mm
Operation	Pull engagement; well-suited to lock/latch operations
Max. force (N)	Up to 23,1 N (@ 10% Duty Cycle)
Life	25 M cycles
Power (W)	10–100
Supply (V)	4,4–142 VDC
Functional Advantages	Economical STA® Series design for volume applications; multiple plunger designs; on/off operation



Technical Data

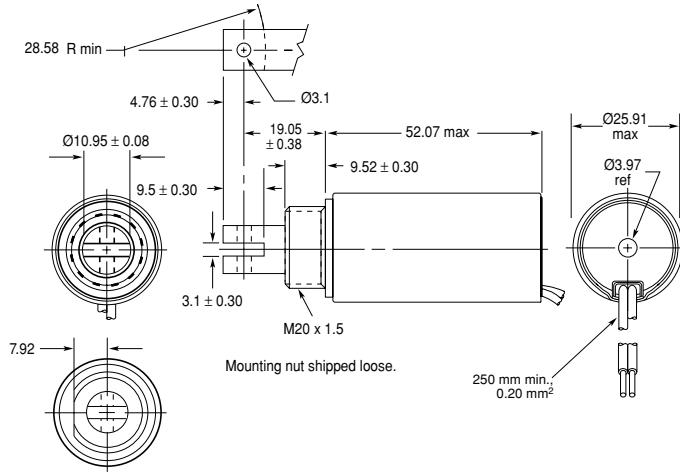
Dielectric Strength Recommended	1000 VRMS Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 102 x 3,2 mm
Coil Resistance	±5% tolerance
Holding Force	Flat Face: 61,52 N @20°C 60°: 29,40 N @20°C
Weight	197,3 g
Plunger Weight	45,36 g

Preferred Range

Type	Size	Function	Duty Cycle	Max. Stroke	Nominal voltage	Force@Nominal Stroke	Nominal power	max. "On time"
195224-229	∅ 26 X 52 mm	Pull	100%	17,8 mm	9,2 VDC	3,4–4,0 N	10 W @20°C	∞ sec
195224-129	∅ 26 X 52 mm	Pull	100%	17,8 mm	9,4 VDC	3,4–4,0 N	10 W @20°C	∞ sec

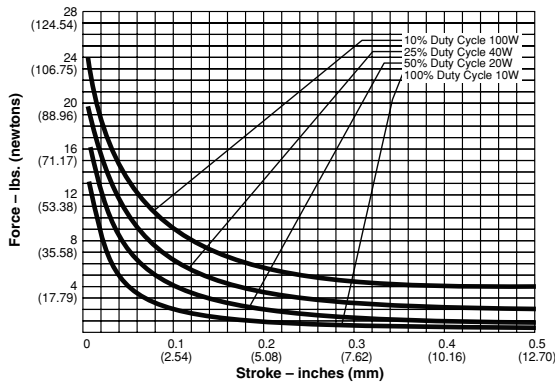
STA Series Pull 26 x 52

Dimensions

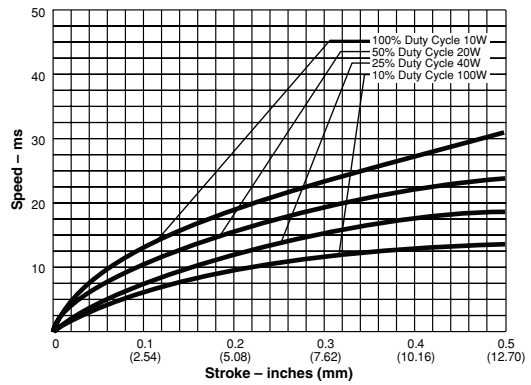


Performance chart

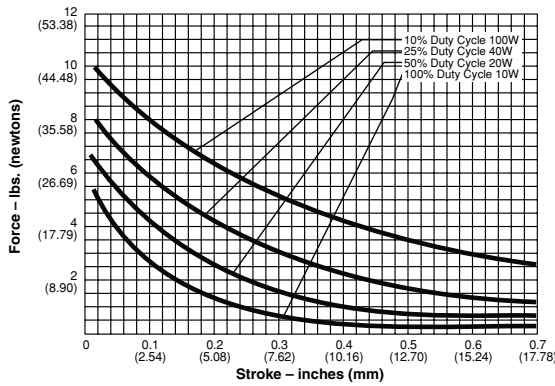
Flat face Plunger, Force



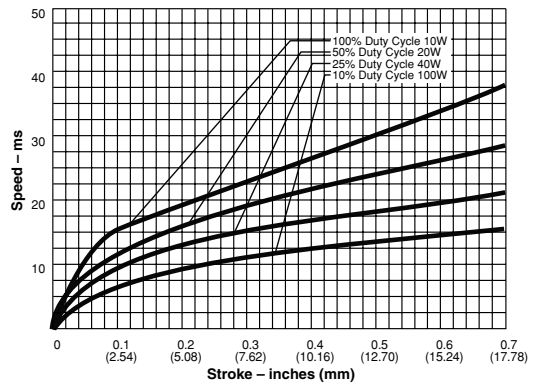
Flat face Plunger, Speed



60° Plunger, Force



60° Plunger, Speed



STA Series Pull 26 x 52

Ordering Reference

Type 195226-(0) Plunger (XX) Coil Data awg (wire diameter)

Plunger Configurations and anti-rotation flat on mounting

- 1 Flat face plunger without anti-rotation flat
- 2 60° plunger without anti-rotation flat
- 5 Flat face plunger with anti-rotation flat
- 6 60° plunger with anti-rotation flat

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	360	32	8		
Force@Nominal Stroke (N)		3.34- 4.00	6.68- 7.79	11.57- 13.35	21.36- 23.14		
Watts (@20°C)		10	20	40	100		
Ampere Turns (@20°C)		1166	1649	2332	3688		
Coil Data	awg (XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	23	1.96	536	4.4	6.3	8.9	14.0
	24	2.69	600	5.2	7.3	10.4	16.4
	25	4.89	840	7.0	9.9	14.0	22.0
	26	8.44	1128	9.2	13.0	18.4	29.0
	27	11.50	1260	10.7	15.2	21.0	34.0
	28	19.20	1645	13.8	19.6	28.0	44.0
	29	31.20	2104	17.7	25.0	35.0	56.0
	30	49.60	2646	22.0	31.0	45.0	70.0
	31	77.40	3280	28.0	39.0	56.0	88.0
	32	119.00	4026	35.0	49.0	69.0	109.0
	33	202.00	5317	45.0	64.0	90.0	142.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

STA 26 x 52

Linear Solenoid

Tubular – Push

STA 26 x 52

Dimensions (mm)	∅ 26 x 52
Duty cycle	continuous or intermittent
Stroke	Nominal Stroke 7.6 mm
Operation	Push engagement; well-suited to lock/latch operations
Max. force (N)	Up to 23,14 N (@ 10% Duty Cycle)
Life	25 M cycles
Power (W)	10–100
Supply (V)	4,4–142 VDC
Functional Advantages	Economical STA® Series design for volume applications; multiple plunger designs; on/off operation



Technical Data

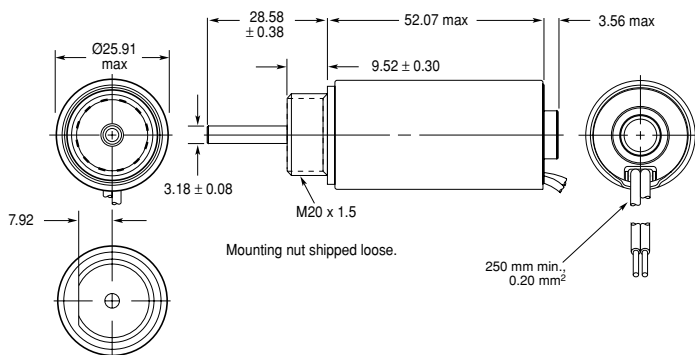
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 102 x 3.2 mm
Coil Resistance	±5% tolerance
Holding Force	Flat Face: 52,58 N @20°C 60°: 28,87 N @20°C
Weight	190.8 g
Plunger Weight	33.74 g

Preferred Range

Type	Size	Function	Duty Cycle	Max. Stroke	Nominal voltage	Force@Nominal Stroke	Nominal power	max. "On time"
195225-229	∅ 26 X 52 mm	Push	100%	17,8 mm	9.2 VDC	2,2–3,3 N	10 W @20°C	∞ sec
195225-129	∅ 26 X 52 mm	Push	100%	17,8 mm	9.2 VDC	2,2–3,3 N	10 W @20°C	∞ sec

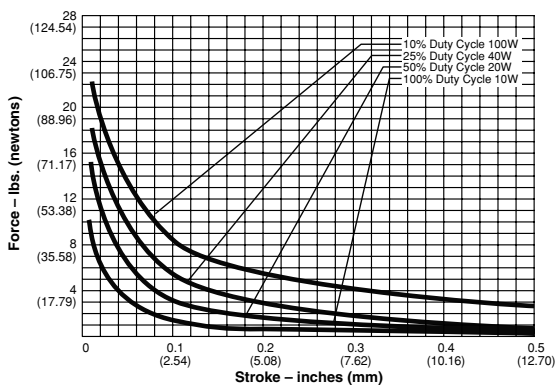
STA Series Push 26 x 52

Dimensions

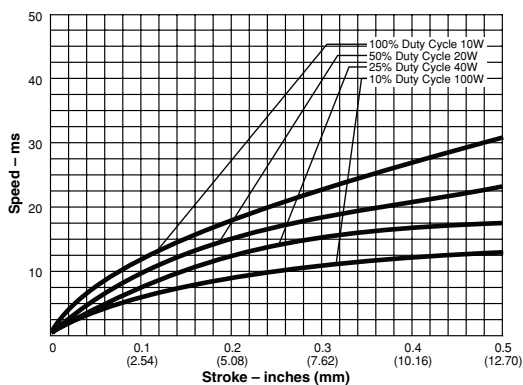


Performance chart

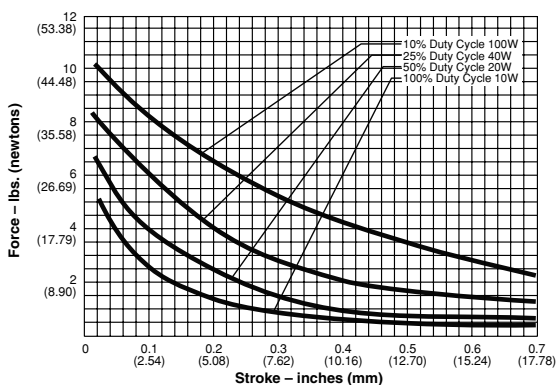
Flat face Plunger, Force



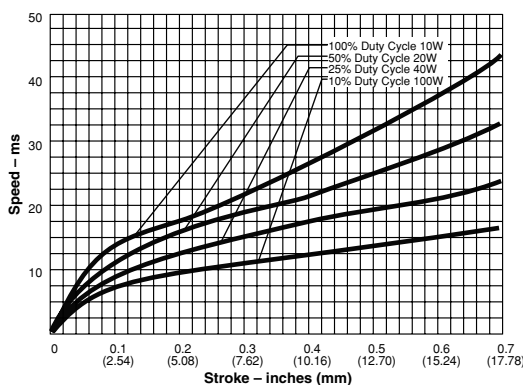
Flat face Plunger, Speed



60° Plunger, Force



60° Plunger, Speed



STA Series Push 26 x 52

Ordering Reference

Type 195227-(0) Plunger (XX) Coil Data awg (wire diameter)

Plunger Configurations and anti-rotation flat on mounting

- 1 Flat face plunger without anti-rotation flat
- 2 60° plunger without anti-rotation flat
- 5 Flat face plunger with anti-rotation flat
- 6 60° plunger with anti-rotation flat

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	360	32	8		
Force@Nominal Stroke (N)		2.22- 3.34	4.45- 8.37	8.9- 12.9	17.9- 23.14		
Watts (@20°C)		10	20	40	100		
Ampere Turns (@20°C)		1166	1649	2332	3688		
Coil Data	awg (XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	23	1.96	536	4.4	6.3	8.9	14.0
	24	2.69	600	5.2	7.3	10.4	16.4
	25	4.89	840	7.0	9.9	14.0	22.0
	26	8.44	1128	9.2	13.0	18.4	29.0
	27	11.50	1260	10.7	15.2	21.0	34.0
	28	19.20	1645	13.8	19.6	28.0	44.0
	29	31.20	2104	17.7	25.0	35.0	56.0
	30	49.60	2646	22.0	31.0	45.0	70.0
	31	77.40	3280	28.0	39.0	56.0	88.0
	32	119.00	4026	35.0	49.0	69.0	109.0
	33	202.00	5317	45.0	64.0	90.0	142.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

STA 125 M

Linear Solenoid

Tubular – Pull

STA 125 M

Dimensions (mm)	∅ 32 x 57
Duty cycle	continous or intermittent
Stroke	Nominal Stroke 10,2 mm
Operation	Pull
Max. force (N)	Up to 28,9 N (@ 10% Duty Cycle)
Life	1 million cycles
Power (W)	13–130
Supply (V)	6,8–218 VDC
Functional Advantages	Economical STA® Series design for volume applications; multiple plunger designs; on/off operation



Technical Data

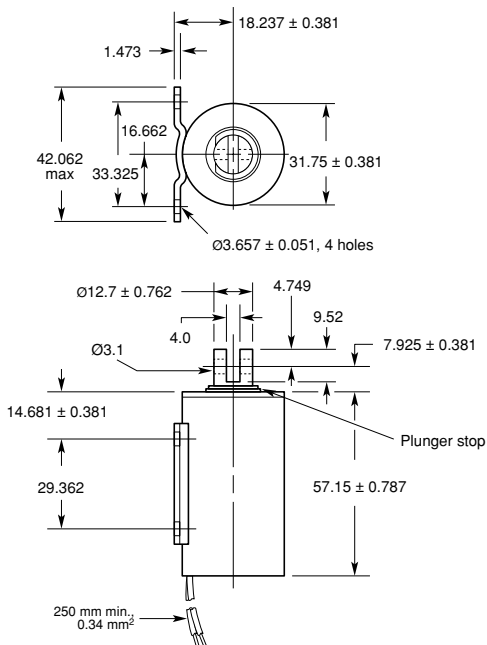
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 127 x 3.2 mm
Coil Resistance	±5% tolerance
Holding Force	40,03 N @20°C
Weight	295 g

Preferred Range

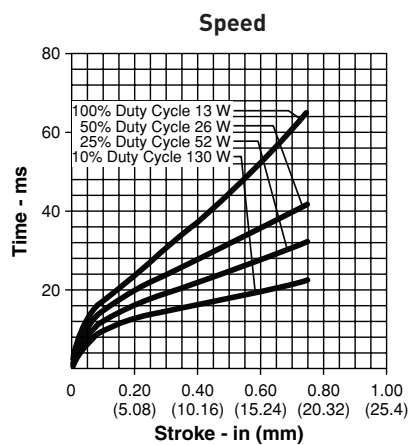
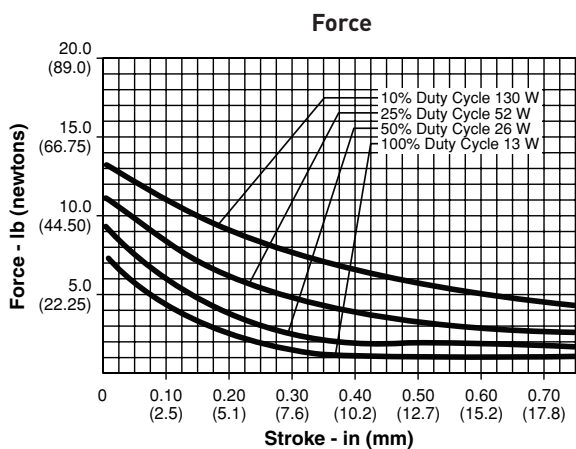
Type	Size	Function	Duty Cycle	Max. Stroke	Nominal voltage	Force@Nominal Stroke	Nominal power	max. "On time"
282366-024	∅ 32 X 57 mm	Pull	100%	19 mm	8,6 VDC	4,5 N	13 W @20°C	∞ sec

STA 125 M Pull

Dimensions



Performance chart



STA 125 M Pull

Ordering Reference

Type 282366-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	390	60	18		
Force@Nominal Stroke (N)		4.45	8.90	17.80	28.9		
Watts (@20°C)		13	26	52	130		
Ampere Turns (@20°C)		1500	2121	3000	4743		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	3.52	780	6.8	9.6	13.6	22.0
	024	6.04	1056	8.6	12.2	17.2	27.0
	025	8.47	1176	10.9	15.4	22.0	34.0
	026	14.10	1540	13.8	19.5	28.0	44.0
	027	22.50	1970	17.3	24.0	35.0	55.0
	028	36.10	2484	22.0	31.0	44.0	69.0
	029	55.10	3060	27.0	38.0	54.0	86.0
	030	88.10	3805	35.0	49.0	70.0	110.0
	031	147.00	5044	44.0	62.0	88.0	139.0
	032	214.00	5992	54.0	76.0	107.0	170.0
	033	354.00	7744	69.0	98.0	138.0	218.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

STA 150 M

Linear Solenoid

Tubular – Pull

STA 150 M

Dimensions (mm)	∅ 38 x 63
Duty cycle	continuous or intermittent
Stroke	Nominal Stroke 10.2 mm
Operation	Pull
Max. force (N)	Up to 43,6 N (@ 10% Duty Cycle)
Life	1 million cycles
Power (W)	17–170
Supply (V)	9,8–315 VDC
Functional Advantages	Economical STA® Series design for volume applications; multiple plunger designs; on/off operation



Technical Data

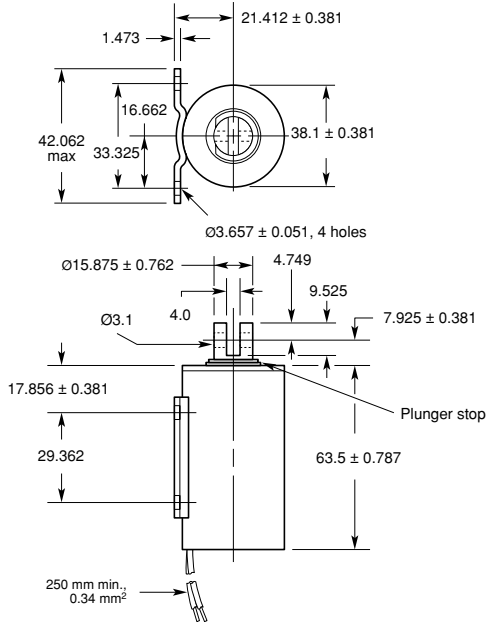
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 152 x 3.2 mm
Coil Resistance	±5% tolerance
Holding Force	64,50 N at 20°C
Weight	481,8 g

Preferred Range

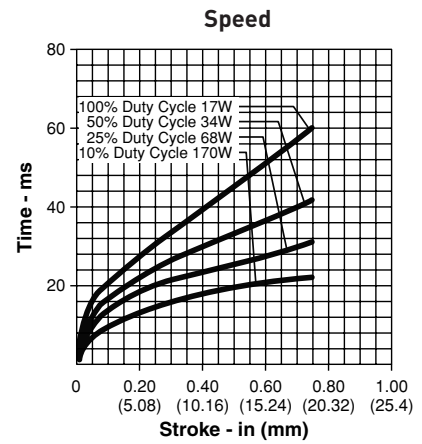
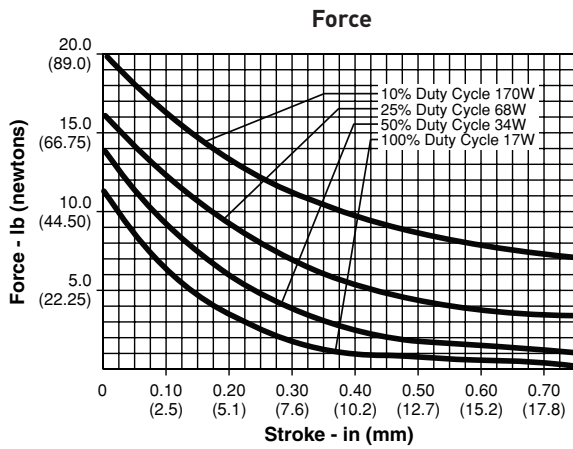
Type	Size	Function	Duty Cycle	Max. Stroke	Nominal voltage	Force@Nominal Stroke	Nominal power	max. "On time"
282367-023	∅ 38 X 63 mm	Pull	100%	19 mm	9,8 VDC	4,5 N	17 W @20°C	∞ sec

STA 150 M Pull

Dimensions



Performance chart



STA 150 M Pull

Ordering Reference

Type 282367-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	420	100	25		
Force@Nominal Stroke (N)		4.45	11.12	23.14	43.61		
Watts (@20°C)		17	34	68	170		
Ampere Turns (@20°C)		1800	2546	3600	5692		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	5.58	1030	9.8	13.9	19.7	31.0
	024	9.30	1344	12.4	17.6	25.0	39.0
	025	14.90	1712	15.7	22.0	31.0	50.0
	026	24.00	2180	19.9	28.0	40.0	63.0
	027	36.90	2680	25.0	35.0	50.0	79.0
	028	58.40	3322	32.0	45.0	63.0	100.0
	029	87.50	4008	39.0	56.0	79.0	124.0
	030	148.00	5292	50.0	71.0	101.0	159.0
	031	224.00	6360	63.0	90.0	127.0	200.0
	032	344.00	7956	78.0	110.0	155.0	246.0
	033	554.00	10070	100.0	141.0	199.0	315.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

Linear Solenoids

Low Profile	Type	Preferred Products	Page
	0ECM	282340-033	120
	1ECM	282342-031	123
	2EFM	282343-030	126
	2ECM	282344-030	129
	3EFM	282345-028	132
	3ECM	282346-028	135
	4EFM	282347-026	138
	4ECM	282348-026	141
	5SFM	282349-024	144
	5ECM	282350-024	147
	6SFM	202351-023	150
	6ECM	282352-023	153

OECM

Linear Solenoid

Low Profile, Conical Face

OECM

Dimensions (mm)	∅ 19 x 13
Duty cycle	continuous or intermittent
Max. Stroke	3,8 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	9,2 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	4,5–45
Supply (V)	1,6–78 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

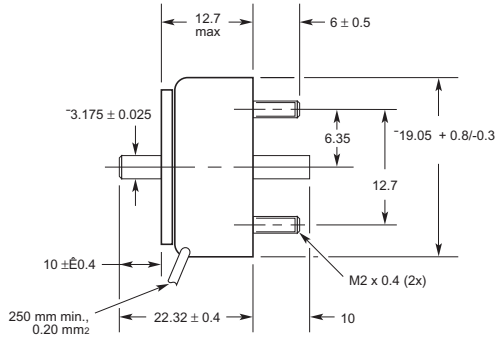
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 51 x 3,2 mm
Coil Resistance	±10% tolerance on all coil awg (wire diameter) sizes
Weight	24,8 g
Holding Force	7,6 N @ 105°C

Preferred Range

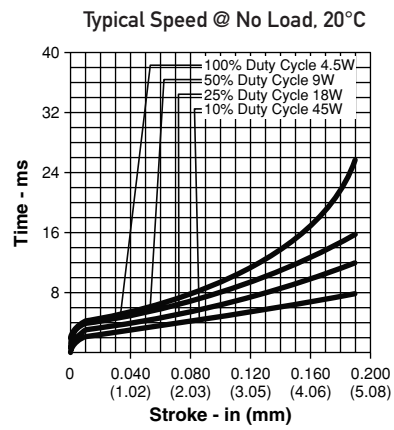
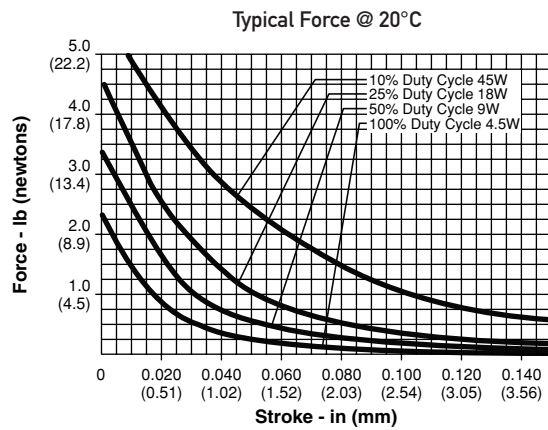
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282340-033	∅ 19 X 13 mm	8 VDC	100%	0,9 N	4,5 W @20°C	∞ sec

Low Profile OEMC

Dimensions



Performance chart



Low Profile OECM

Ordering Reference

Type 282340-(OXX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	7		
Force@Nominal Stroke (N)		0.9	2	4.2	9.2		
Watts (@20°C)		4.5	9	18	45		
Ampere Turns (@20°C)		285	403	570	901		
Coil Data	awg (OXX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	026	0.50	90	1.6	2.3	3.2	5.1
	027*	0.97	136	2.0	2.8	3.9	6.3
	028	1.33	152	2.6	3.7	5.1	8.1
	029*	2.40	215	3.2	4.4	6.2	9.9
	030	3.29	240	4.1	5.7	8.0	12.7
	031	5.61	324	5.0	7.1	9.9	15.8
	032	9.09	420	6.3	8.9	12.4	19.7
	033	14.95	544	8.0	11.3	15.7	25.0
	034	24.06	684	10.2	14.4	20.0	32.0
	035	37.10	840	12.8	18.1	25.0	40.0
	036	58.51	1056	16.1	23.0	32.0	50.0
	037	78.70	1109	19.8	28.0	39.0	62.0
	038	123.00	1370	25.0	35.0	49.0	78.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures

1ECM

Linear Solenoid

Low Profile, Conical Face

1ECM

Dimensions (mm)	∅ 25 x 14
Duty cycle	continuous or intermittent
Max. Stroke	6,1 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	14,2 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	5-50
Supply (V)	2,1-83 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

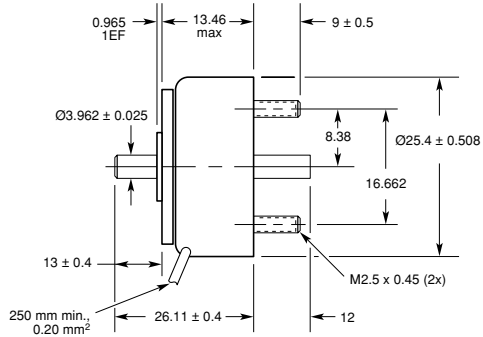
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 76 x 3,2 mm
Coil Resistance	25-35 awg (wire diameter), ±5%; 36 awg (wire diameter), ±10%
Weight	42,5 g
Holding Force	24 N @ 105° C

Preferred Range

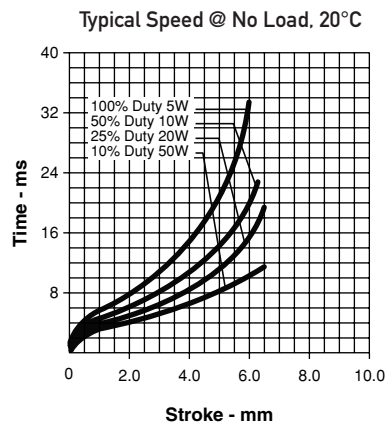
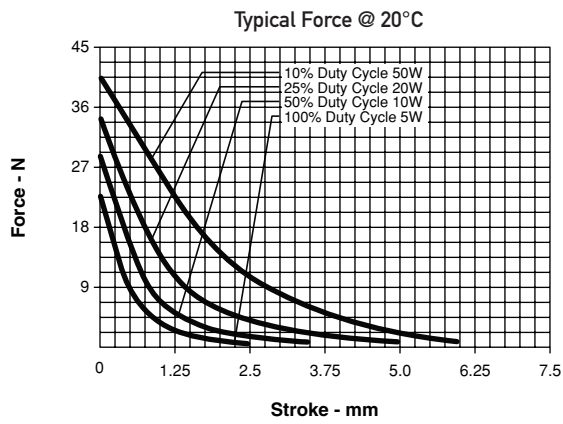
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282342-031	∅ 25 X 14 mm	8,2 VDC	100%	1,1 N	5 W @20°C	∞ sec

Low Profile 1ECM

Dimensions



Performance chart



Low Profile 1ECM

Ordering Reference

Type 282342-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	7		
Force@Nominal Stroke (N)		1.1	2.2	5.6	14.2		
Watts (@20°C)		5	10	20	50		
Ampere Turns (@20°C)		340	480	680	1075		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	025	0.83	140	2.1	2.9	4.1	6.5
	026	1.38	186	2.6	3.7	5.2	8.2
	027	1.91	210	3.2	4.5	6.3	10.1
	028	3.17	273	4.1	5.7	8.1	12.8
	029	5.17	352	5.1	7.2	10.2	16.2
	030	8.25	441	6.5	9.2	13.0	21.0
	031	12.95	550	8.2	11.6	16.4	26.0
	032	20.71	682	10.6	14.9	21.0	34.0
	033	30.60	828	12.7	18.2	26.0	41.0
	034	50.95	1078	16.5	23.0	33.0	52.0
	035	83.92	1392	21.0	30.0	42.0	67.0
	036	112.00	1500	26.0	37.0	52.0	83.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures

2EFM

Linear Solenoid

Low Profile, Flat Face

2EFM

Dimensions (mm)	∅ 29 x 15
Duty cycle	continuous or intermittent
Max. Stroke	1,9 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	60 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	7-70
Supply (V)	2,2-56 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

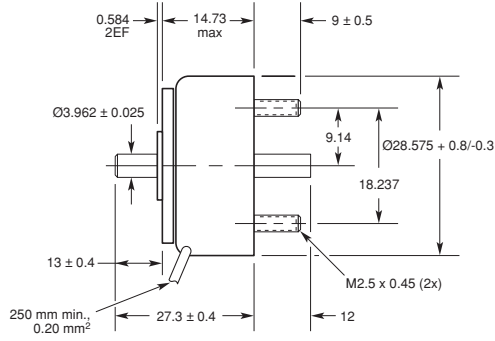
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20° C, with solenoid mounted on the equivalent of an aluminium plate measuring 86 x 3.2 mm
Coil Resistance	24-33 awg (wire diameter), ±5%
Weight	63,8 g
Holding Force 2EF	53,4 N @105°C
Holding Force 2EC	25,4 N @105°C

Preferred Range

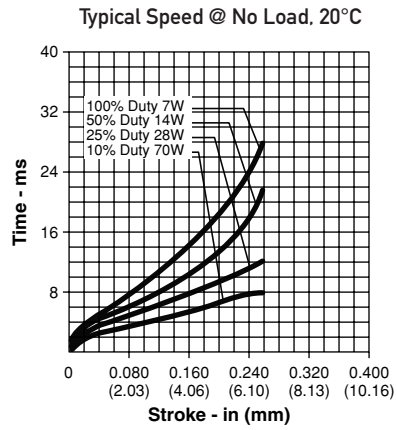
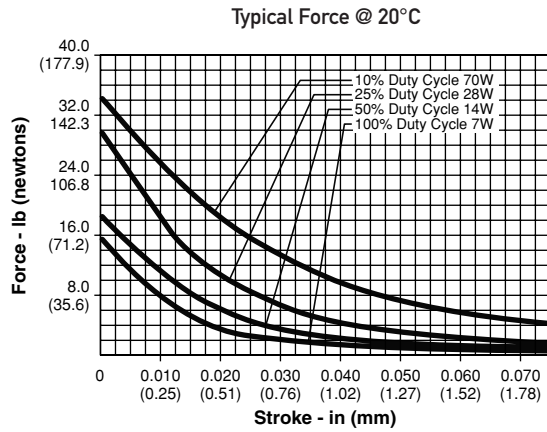
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time" (sec)
282343-030	∅ 29 X 15 mm	8,8 VDC	100%	8,9 N	7 W @20°C	∞ sec

Low Profile 2EFM

Dimensions



Performance chart



Low Profile 2EFM

Ordering Reference

Type 282343-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	7		
Force@Nominal Stroke (N)		8.9	15.6	31.2	60		
Watts (@20°C)		7	14	28	70		
Ampere Turns (@20°C)		425	602	849	1350		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	024	0.68	130	2.2	3.2	4.5	7.1
	025	1.16	174	2.8	4.0	5.7	9.0
	026	1.96	231	3.6	5.1	7.2	11.5
	027	3.16	296	4.5	6.4	9.0	14.4
	028	5.10	378	5.7	8.1	11.5	18.2
	029	6.94	423	7.0	9.9	13.9	22.0
	030	11.03	530	8.8	12.5	17.7	28.0
	031	16.85	649	11.0	15.6	22.0	35.0
	032	28.15	858	13.9	19.8	28.0	44.0
	033	42.75	1036	17.5	25.0	35.0	56.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures

2ECM

Linear Solenoid

Low Profile, Conical Face

2ECM

Dimensions (mm)	∅ 29 x 15
Duty cycle	continuous or intermittent
Max. Stroke	6,1 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	16,7 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	7-70
Supply (V)	2,2-56 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

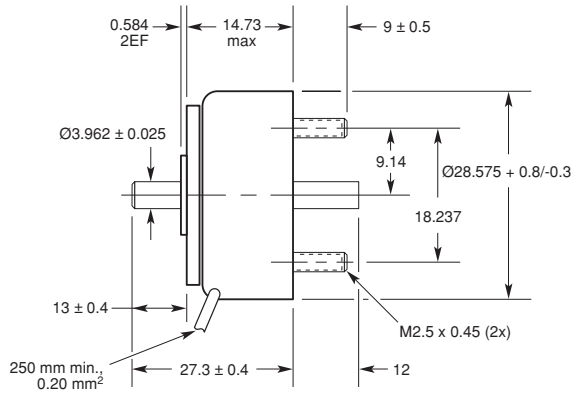
Dielectric Strength	1000 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 86 x 3.2 mm thick
Coil Resistance	24-33 awg (wire diameter), ±5%
Weight	63,8 g
Holding Force 2EF	53,4 N @105°C
Holding Force 2EC	25,4 N @105°C

Preferred Range

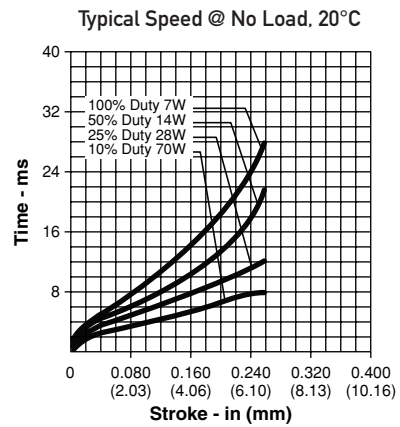
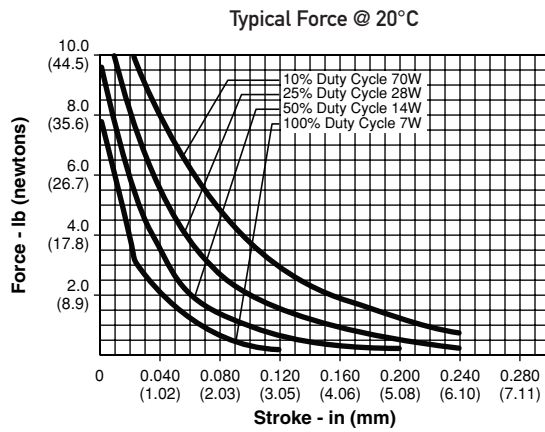
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282344-030	∅ 29 X 15 mm	8,8 VDC	100%	1,1 N	7 W @20°C	∞ sec

Low Profile 2ECM

Dimensions



Performance chart



Low Profile 2ECM

Ordering Reference

Type 282344-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	7		
Force@Nominal Stroke (N)		1.1	4.5	8.9	16.7		
Watts (@20°C)		7	14	28	70		
Ampere Turns (@20°C)		425	602	849	1350		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	024	0.68	130	2.2	3.2	4.5	7.1
	025	1.16	174	2.8	4.0	5.7	9.0
	026	1.96	231	3.6	5.1	7.2	11.5
	027	3.16	296	4.5	6.4	9.0	14.4
	028	5.10	378	5.7	8.1	11.5	18.2
	029	6.94	423	7.0	9.9	13.9	22.0
	030	11.03	530	8.8	12.5	17.7	28.0
	031	16.85	649	11.0	15.6	22.0	35.0
	032	28.15	858	13.9	19.8	28.0	44.0
	033	42.75	1036	17.5	25.0	35.0	56.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures

3EFM

Linear Solenoid

Low Profile, Flat Face

3EFM

Dimensions (mm)	∅ 33 x 18
Duty cycle	continuous or intermittent
Max. Stroke	1,9 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	89 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	9-90
Supply (V)	2,6-83 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

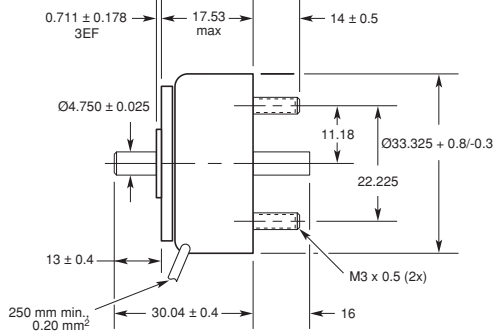
Dielectric Strength Recommended	23-27 awg (wire diameter), 1000 VRMS; 28-33 awg (wire diameter), 1200 VRMS
Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 118 x 3,2 mm
Coil Resistance	23-33 awg (wire diameter), ±5%
Weight	106,3 g
Holding Force 3EF	115,6 N @105°C
Holding Force 3EC	53,4 N @105°C

Preferred Range

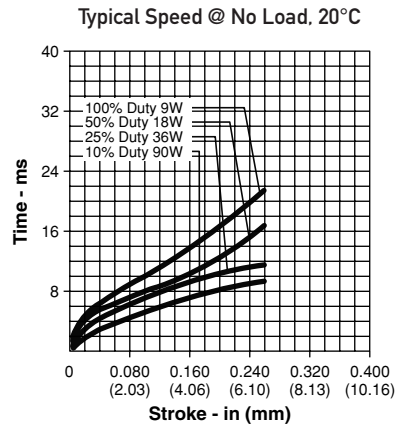
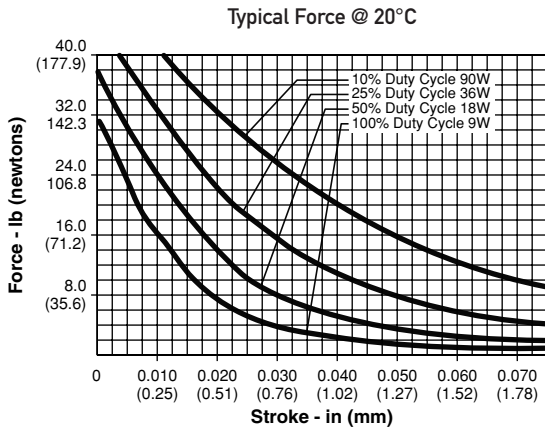
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282345-028	∅ 33 X 18 mm	8,4 VDC	100%	11,1 N	9 W @20°C	∞ sec

Low Profile 3EFM

Dimensions



Performance chart



Low Profile 3EFM

Ordering Reference

Type 282345-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	8		
Force@Nominal Stroke (N)		11.1	22.3	49	89		
Watts (@20°C)		9	18	36	90		
Ampere Turns (@20°C)		535	756	1070	1690		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	0.70	145	2.6	3.7	5.2	8.2
	024	1.18	192	3.3	4.6	6.6	10.4
	025	1.97	252	4.2	5.9	8.4	13.2
	026	3.26	328	5.3	7.5	10.6	16.8
	027	5.04	405	6.7	9.4	13.3	21.0
	028	8.02	510	8.4	11.9	16.8	27.0
	029	12.21	627	10.4	14.7	21.0	33.0
	030	19.20	780	13.2	18.6	26.0	42.0
	031	31.84	1008	16.9	24.0	34.0	53.0
	032	46.97	1215	21.0	29.0	41.0	65.0
	033	75.30	1530	26.0	37.0	53.0	83.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

3ECM

Linear Solenoid

Low Profile, Conical Face

3ECM

Dimensions (mm)	∅ 33 x 18
Duty cycle	continuous or intermittent
Max. Stroke	7,6 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	24,9 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	9-90
Supply (V)	2,6-83 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

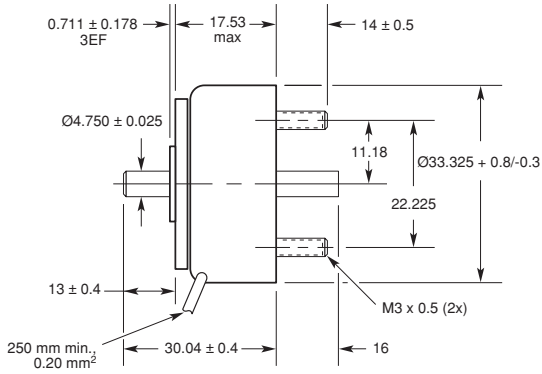
Dielectric Strength	23-27 awg (wire diameter), 1000 VRMS; 28-33 awg (wire diameter), 1200 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 118 x 3,2 mm
Coil Resistance	23-33 awg (wire diameter), ±5%
Weight	106,3 g
Holding Force 3EF	115,6 N @105°C
Holding Force 3EC	53,4 N @105°C

Preferred Range

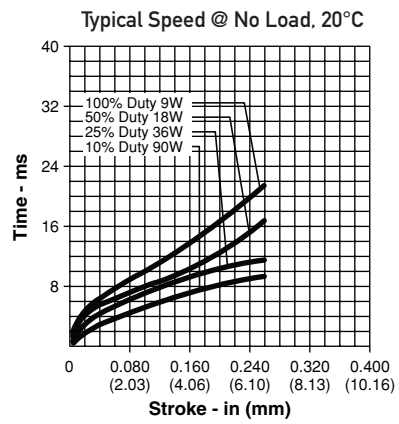
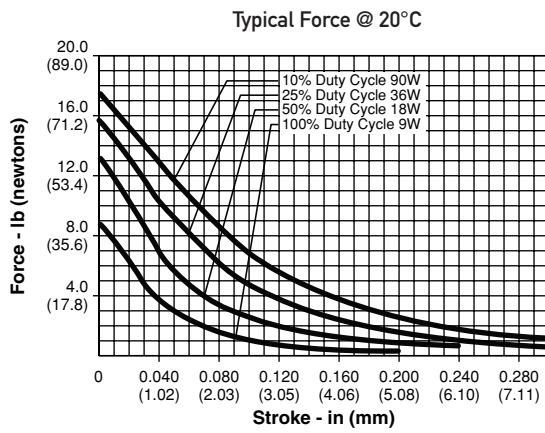
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282346-028	∅ 33 X 18 mm	8,4 VDC	100%	3,6 N	9 W @20°C	∞ sec

Low Profile 3ECM

Dimensions



Performance chart



Low Profile 3ECM

Ordering Reference

Type 282346-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	8		
Force@Nominal Stroke (N)		3.6	8.9	16.9	24.9		
Watts (@20°C)		9	18	36	90		
Ampere Turns (@20°C)		535	756	1070	1690		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	0.70	145	2.6	3.7	5.2	8.2
	024	1.18	192	3.3	4.6	6.6	10.4
	025	1.97	252	4.2	5.9	8.4	13.2
	026	3.26	328	5.3	7.5	10.6	16.8
	027	5.04	405	6.7	9.4	13.3	21.0
	028	8.02	510	8.4	11.9	16.8	27.0
	029	12.21	627	10.4	14.7	21.0	33.0
	030	19.20	780	13.2	18.6	26.0	42.0
	031	31.84	1008	16.9	24.0	34.0	53.0
	032	46.97	1215	21.0	29.0	41.0	65.0
	033	75.30	1530	26.0	37.0	53.0	83.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

4EFM

Linear Solenoid

Low Profile, Flat Face

4EFM

Dimensions (mm)	∅ 40 x 21
Duty cycle	continuous or intermittent
Max. Stroke	3,0 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	111,3 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	12,5–125
Supply (V)	4,3–132 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

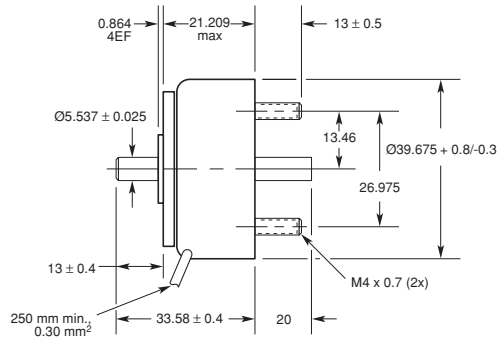
Dielectric Strength Recommended	23-24 awg (wire diameter), 1000 VRMS; 25-33 awg (wire diameter), 1200 VRMS
Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 159 x 3,2 mm
Coil Resistance	23-33 awg (wire diameter), ±5%
Weight	170 g
Holding Force 4EF	164,6 N @105°C
Holding Force 4EC	71,2 N @105°C

Preferred Range

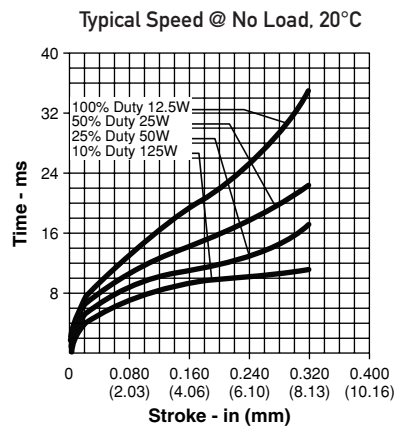
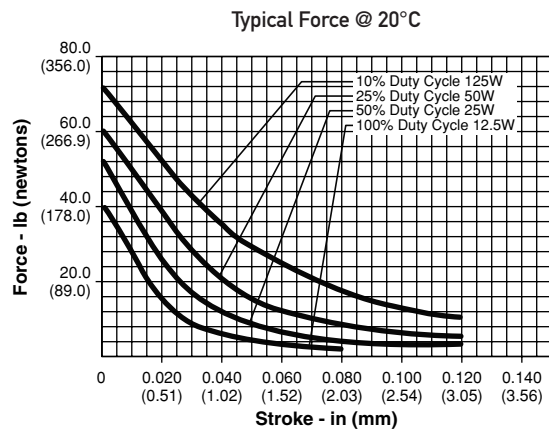
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282347-026	∅ 40 X 21 mm	8,3 VDC	100%	13,4 N	12,5 W @20°C	∞ sec

Low Profile 4EFM

Dimensions



Performance chart



Low Profile 4EFM

Ordering Reference

Type 282347-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	9		
Force@Nominal Stroke (N)		13.4	28.9	53.4	111.3		
Watts (@20°C)		12.5	25	50	125		
Ampere Turns (@20°C)		714	1000	1425	2250		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	1.59	266	4.3	6.0	8.5	13.4
	024	2.20	301	5.2	7.3	10.4	16.4
	025	3.54	384	6.6	9.2	13.1	21.0
	026	5.67	486	8.3	11.7	16.6	26.0
	027	8.76	600	10.4	14.6	21.0	33.0
	028	13.80	748	13.2	18.5	26.0	42.0
	029	22.60	975	16.6	23.0	33.0	52.0
	030	34.80	1190	21.0	29.0	42.0	66.0
	031	56.70	1520	27.0	37.0	53.0	84.0
	032	88.30	1908	33.0	46.0	66.0	104.0
	033	138.00	2360	42.0	59.0	83.0	132.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

4ECM

Linear Solenoid

Low Profile, Conical Face

4ECM

Dimensions (mm)	∅ 40 x 21
Duty cycle	continuous or intermittent
Max. Stroke	6,3 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	51,2 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	12,5–125
Supply (V)	4,3–132 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

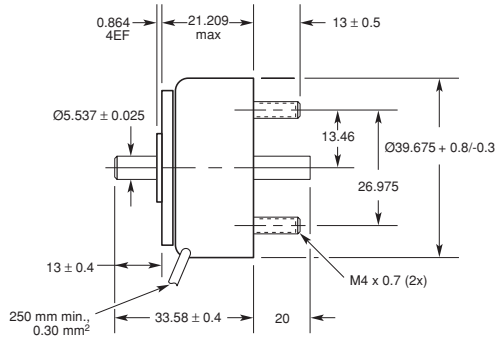
Dielectric Strength Recommended	23-24 awg (wire diameter), 1000 VRMS; 25-33 awg (wire diameter), 1200 VRMS
Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 159 x 3,2 mm
Coil Resistance	23-33 awg (wire diameter), ±5%
Weight	170 g
Holding Force 4EF	164,6 N @105°C
Holding Force 4EC	71,2 N @105°C

Preferred Range

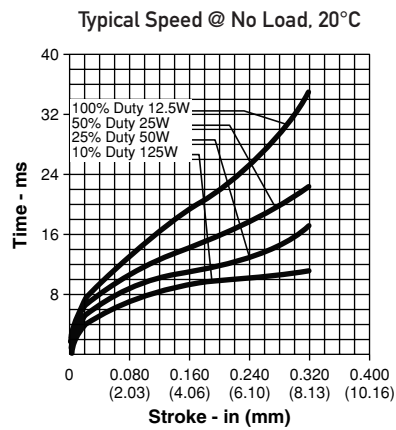
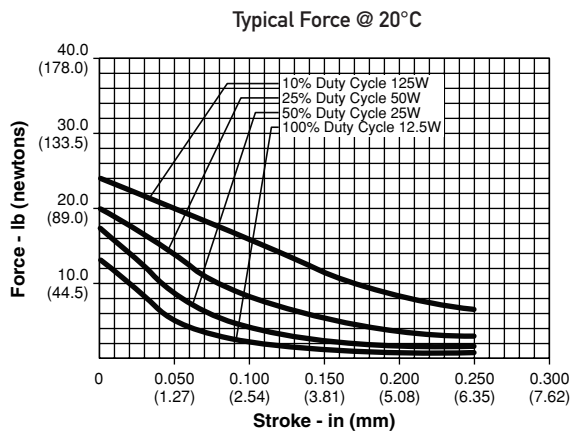
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282348-026	∅ 40 X 21 mm	8,3 VDC	100%	4,5 N	12,5 W @20°C	∞ sec

Low Profile 4ECM

Dimensions



Performance chart



Low Profile 4ECM

Ordering Reference

Type 282348-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	9		
Force@Nominal Stroke (N)		4.5	10	24.5	51.2		
Watts (@20°C)		12.5	25	50	125		
Ampere Turns (@20°C)		714	1000	1425	2250		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	1.59	266	4.3	6.0	8.5	13.4
	024	2.20	301	5.2	7.3	10.4	16.4
	025	3.54	384	6.6	9.2	13.1	21.0
	026	5.67	486	8.3	11.7	16.6	26.0
	027	8.76	600	10.4	14.6	21.0	33.0
	028	13.80	748	13.2	18.5	26.0	42.0
	029	22.60	975	16.6	23.0	33.0	52.0
	030	34.80	1190	21.0	29.0	42.0	66.0
	031	56.70	1520	27.0	37.0	53.0	84.0
	032	88.30	1908	33.0	46.0	66.0	104.0
	033	138.00	2360	42.0	59.0	83.0	132.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

5SFM

Linear Solenoid

Low Profile, Flat Face

5SFM

Dimensions (mm)	∅ 48 x 22
Duty cycle	continuous or intermittent
Max. Stroke	3,6 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	173,6 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	21–210
Supply (V)	6,1–192 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

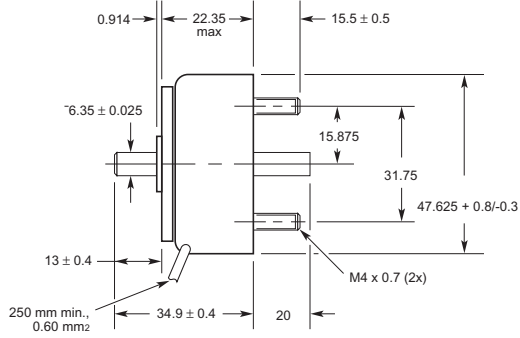
Dielectric Strength Recommended	23 awg (wire diameter), 1000 VRMS; 24-33 awg (wire diameter), 1200 VRMS
Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 191 x 3,2 mm
Coil Resistance	23-33 awg (wire diameter), ±5%
Weight	255 g
Holding Force	258 N @105°C

Preferred Range

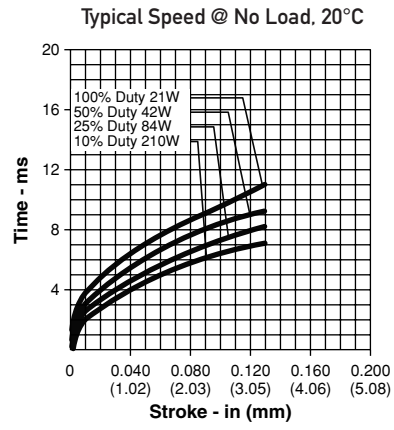
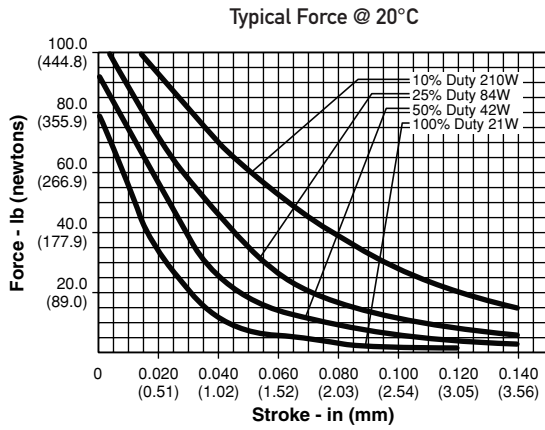
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282349-024	∅ 48 X 22 mm	7,6 VDC	100%	13,4 N	21 W @20°C	∞ sec

Low Profile 5SFM

Dimensions



Performance chart



Low Profile 5SFM

Ordering Reference

Type 282349-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	10		
Force@Nominal Stroke (N)		13.4	42.3	75.7	173.6		
Watts (@20°C)		21	42	84	210		
Ampere Turns (@20°C)		860	1220	1720	2730		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	2.03	288	6.1	8.6	12.1	19.2
	024	3.20	360	7.6	10.8	15.3	24.0
	025	4.91	440	9.6	13.6	19.2	31.0
	026	7.72	550	12.1	17.1	24.0	38.0
	027	11.12	636	15.0	21.0	30.0	48.0
	028	18.79	840	19.2	27.0	39.0	61.0
	029	30.48	1088	24.0	34.0	48.0	77.0
	030	44.86	1275	30.0	43.0	61.0	96.0
	031	70.90	1596	38.0	54.0	76.0	121.0
	032	109.00	1974	47.0	67.0	95.0	150.0
	033	175.00	2496	60.0	86.0	121.0	192.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

5ECM

Linear Solenoid

Low Profile, Conical Face

5ECM

Dimensions (mm)	∅ 48 x 26
Duty cycle	continuous or intermittent
Max. Stroke	10,2 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	93,5 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	21–210
Supply (V)	7,2–226 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

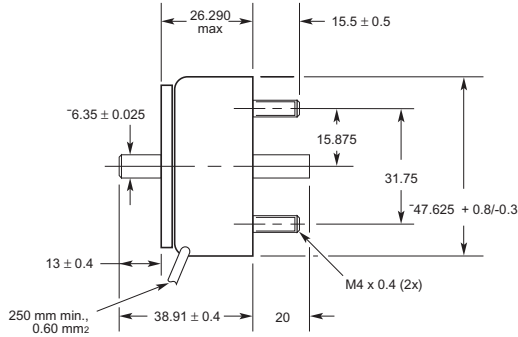
Dielectric Strength	23 awg (wire diameter), 1000 VRMS; 24-33 awg (wire diameter), 1200 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 191 x 3.2 mm
Coil Resistance	23-33 awg (wire diameter), ±5%
Weight	326 g
Holding Force	120,1 N @105°C

Preferred Range

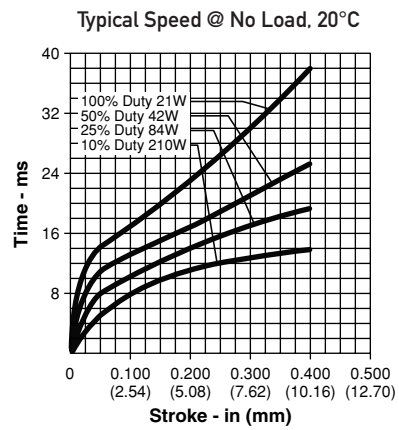
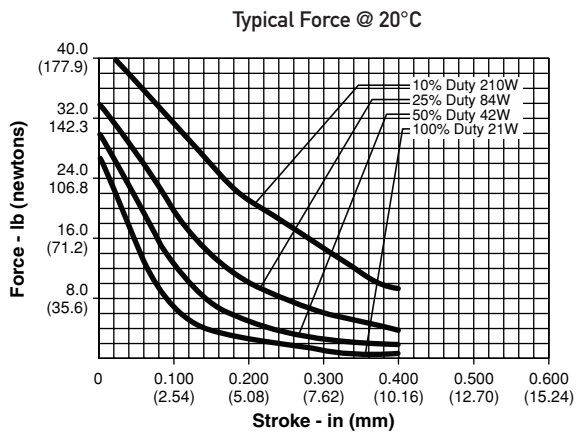
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282350-024	∅ 48 X 26 mm	9 VDC	100%	11,1 N	21 W @20°C	∞ sec

Low Profile 5ECM

Dimensions



Performance chart



Low Profile 5ECM

Ordering Reference

Type 282350-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	100	36	10		
Force@Nominal Stroke (N)		11.1	22.3	44.5	93.5		
Watts (@20°C)		21	42	84	210		
Ampere Turns (@20°C)		1015	1440	2030	3210		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	2.70	384	7.2	10.1	14.3	23.0
	024	4.30	486	9.0	12.7	18.0	28.0
	025	6.66	590	11.5	16.2	23.0	36.0
	026	10.30	737	14.0	20.0	28.0	44.0
	027	15.70	900	17.7	25.0	35.0	56.0
	028	26.60	1190	23.0	32.0	45.0	72.0
	029	38.00	1380	28.0	40.0	56.0	89.0
	030	62.10	1768	36.0	51.0	71.0	113.0
	031	96.10	2166	45.0	64.0	90.0	143.0
	032	157.00	2816	57.0	80.0	113.0	179.0
	033	241.00	3432	71.0	101.0	143.0	226.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

6SFM

Linear Solenoid

Low Profile, Flat Face

6SFM

Dimensions (mm)	∅ 57 x 29
Duty cycle	continuous or intermittent
Max. Stroke	4,6 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	356 N (@10% Duty Cycle)
Life	5 M cycles
Power (W)	32–320
Supply (V)	10,3–331 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

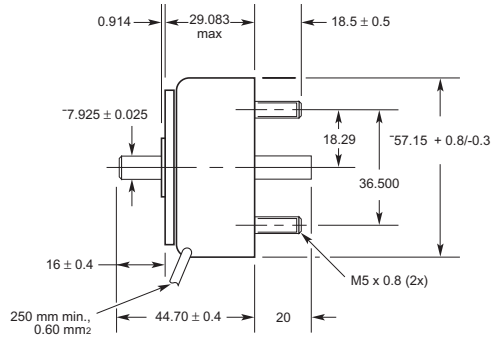
Dielectric Strength	23-31 awg (wire diameter), 1200 VRMS; 32-33 awg (wire diameter), 1500 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 314 x 3,2 mm
Coil Resistance	23-33 awg (wire diameter), ±5%
Weight	510,3 g
Holding Force	391,4 N @105°C

Preferred Range

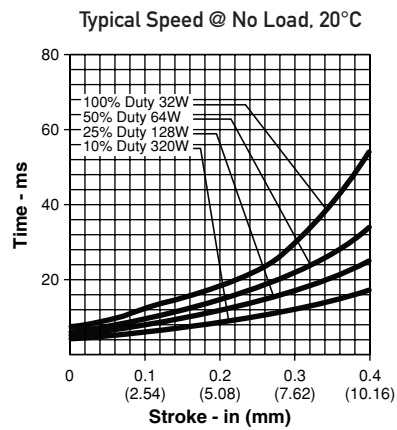
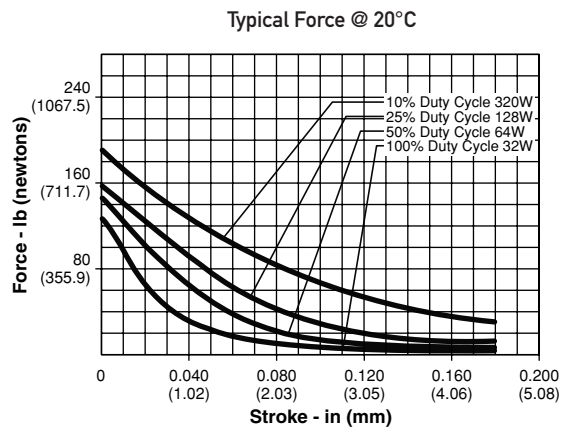
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
202351-023	∅ 57 X 29 mm	10,3 VDC	100%	44,5 N	32 W @20°C	∞ sec

Low Profile 6SFM

Dimensions



Performance chart



Low Profile 6SFM

Ordering Reference

Type 202351-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	87	36	13		
Force@Nominal Stroke (N)		44.5	89	178	356		
Watts (@20°C)		32	64	128	320		
Ampere Turns (@20°C)		1240	1760	2490	3920		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	3.59	432	10.3	14.6	21.0	33.0
	024	5.24	500	13.0	18.4	26.0	41.0
	025	9.51	708	16.7	24.0	33.0	53.0
	026	14.44	858	21.0	30.0	42.0	66.0
	027	23.69	1110	27.0	38.0	53.0	84.0
	028	38.27	1411	34.0	48.0	68.0	106.0
	029	54.62	1638	41.0	59.0	83.0	131.0
	030	93.67	2184	53.0	76.0	107.0	168.0
	031	143.00	2645	67.0	95.0	134.0	211.0
	032	223.00	3328	83.0	118.0	167.0	262.0
	033	338.00	4004	105.0	149.0	210.0	331.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.

6ECM

Linear Solenoid

Low Profile, Conical Face

6ECM

Dimensions (mm)	∅ 57 x 34
Duty cycle	continuous or intermittent
Max. Stroke	10,1 mm
Operation	Push or pull operations Pull use: Opposite of mounting pegs
Max. force (N)	191,4 N (@10% Duty Cycle)
Life	1 million cycles
Ratings (W)	32–320
Supply (V)	12,3–394 VDC
Functional Advantages	Ideal for high force, medium stroke applications: on/off operation



Technical Data

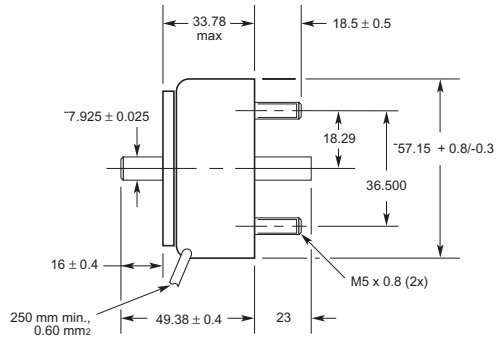
Dielectric Strength	23-31 awg (wire diameter), 1200 VRMS; 32-33 awg (wire diameter), 1500 VRMS
Recommended Minimum Heat Sink	Maximum watts dissipated by solenoid are based on an unrestricted flow of air at 20°C, with solenoid mounted on the equivalent of an aluminium plate measuring 314 x 3,2 mm
Coil Resistance	23-33 awg (wire diameter), ±5%
Weight	609,5 g
Holding Force	218 N @105°C

Preferred Range

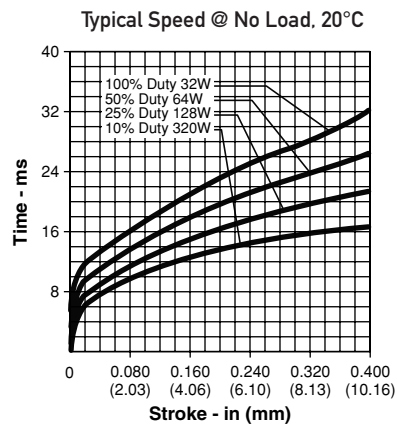
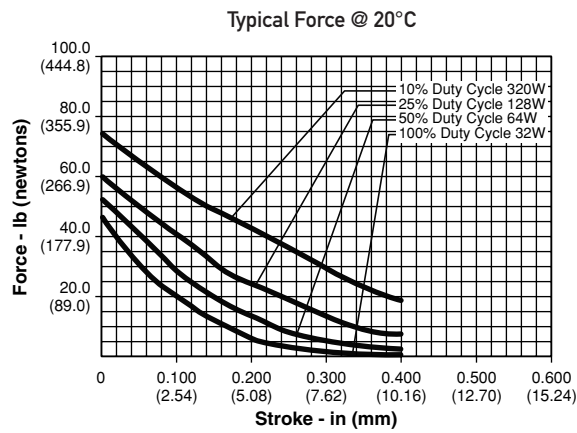
Type	Size	Nominal voltage	Duty Cycle	Force@Nominal Stroke	Nominal power	max. "On time"
282352-023	∅ 57 X 34 mm	12,3 VDC	100%	26,7 N	32 W @20°C	∞ sec

Low Profile 6ECM

Dimensions



Performance chart



Low Profile 6ECM

Ordering Reference

Type 282352-(0XX) Coil Data awg (wire diameter)

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously ¹		∞	87	36	13		
Force@Nominal Stroke (N)		26.7	57.9	106.8	191.4		
Watts (@20°C)		32	64	128	320		
Ampere Turns (@20°C)		1480	2080	2940	4620		
Coil Data	awg (0XX) ²	Resistance (@20°C)	# Turns ³	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
	023	4.69	567	12.3	17.2	24.0	38.0
	024	7.43	710	15.5	22.0	31.0	48.0
	025	12.90	960	19.9	28.0	39.0	62.0
	026	19.70	1170	25.0	35.0	49.0	78.0
	027	32.00	1500	32.0	44.0	63.0	99.0
	028	51.60	1904	40.0	56.0	79.0	125.0
	029	74.40	2232	49.0	69.0	98.0	154.0
	030	126.00	2940	63.0	89.0	126.0	198.0
	031	195.00	3611	80.0	112.0	159.0	250.0
	032	288.00	4350	98.0	138.0	195.0	306.0
	033	427.00	5010	126.0	177.0	251.0	394.0

¹ Continuously pulsed at stated watts and duty cycle

² Other coil awg (wire diameter) sizes available — please enquire

³ Reference number of turns

All data is at 20°C coil temperature. Force outputs degrade with increased temperatures.



Linear Solenoids

Open Frame	Type	Preferred Products	Page
DC Operation	B-75M	B75M-3000	158
	B-4HDM	B4HDM-255-M-36	161
	B-11M	B11M-255-M-36	164
	B-16M	B16M-255-B-1	167
	B-17M	B17M-255-A-1	170
	B-22M	B22M-255-M-36	173
	B-41M	B41M-255-B-1	176
	C-8M	C8M-273-M-36	179
	C-9M	C9M-273-M-36	182
	C-15M	C15M-273-B-36	185
	C-26M	C26M-273-M-36	188
	C-33M	C33M-273-M-33	191
	C-34M	C34M-273-M-36	194

B-75M

Linear Solenoid

Open Frame, DC

B-75M

Dimensions (mm)	29 x 28 x 41.5
Duty cycle	continuous or intermittent
Maximum Stroke	12 mm
Operation	DC
Typical Force (N)	12 N (@5% Duty Cycle /230 VAC/11 mm stroke)
Life	100 000 cycles
Housing	Compact box frame design with tapped mounting holes
Functional Advantages	DC activated; continuous or intermittent duty pull-in/push out engagement and built in thermal protector available. different plunger and assembly designs possible



Technical Data

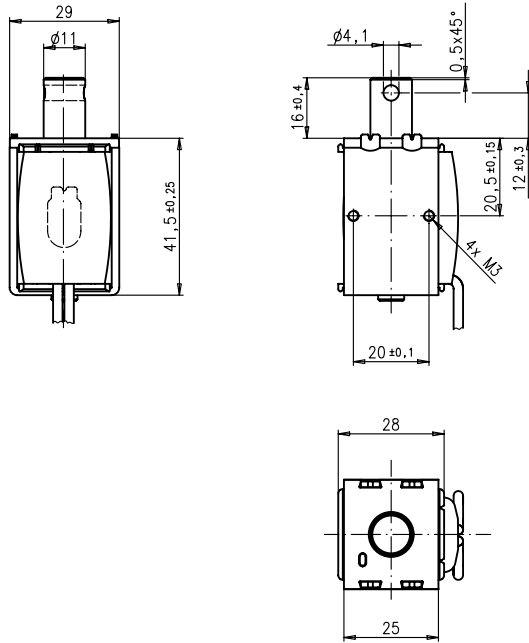
Max ambient temperature	50°C
Holding Force	20 N at 20°C (100% duty cycle, 230 VAC)
Insulation class	Class "B": 130°C max. temperature
Basic Insulation	EN 60335-1
Coil Termination	lead wires
Plunger Weight	30 g
Total Weight	160 g

Preferred Range

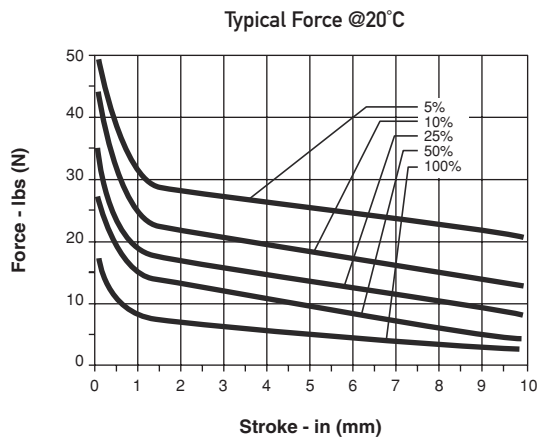
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	max. "On time"
B75M-3000	29 x 28 x 41.5 mm	230 VAC	5%	Box	Taped	0,8 sec

Open Frame B-75M

Dimensions



Performance chart



Open Frame B-75M

Ordering Reference

Type B75M-(XXX) Coil Data

Performance	100%	50%	25%	10%
Maximum ON Time (sec) when pulsed continuously	∞	83	34	13
Watts (@20°C)	12.5	25	50	125
Ampere Turns (@20°C)	1536	2174	3073	4860

Coil Data	Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number						
B4HDM-255-M-36	2.94	754	6	8.5	12	19
B4HDM-254-M-36	11.42	1467	12	17	24	38
B4HDM-253-M-36	46.83	2964	24	34	48	76
B4HDM-252-M-36	181	5724	48	68	96	152
B4HDM-251-M-36	1157	14239	120	170	240	380

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

B-4HDM

Linear Solenoid

Open Frame, DC

B-4HDM

Dimensions (mm)	41 x 37 x 55
Duty cycle	continuous or intermittent
Maximum Stroke	25,4 mm
Operation	DC
Typical Force (N)	15,6 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

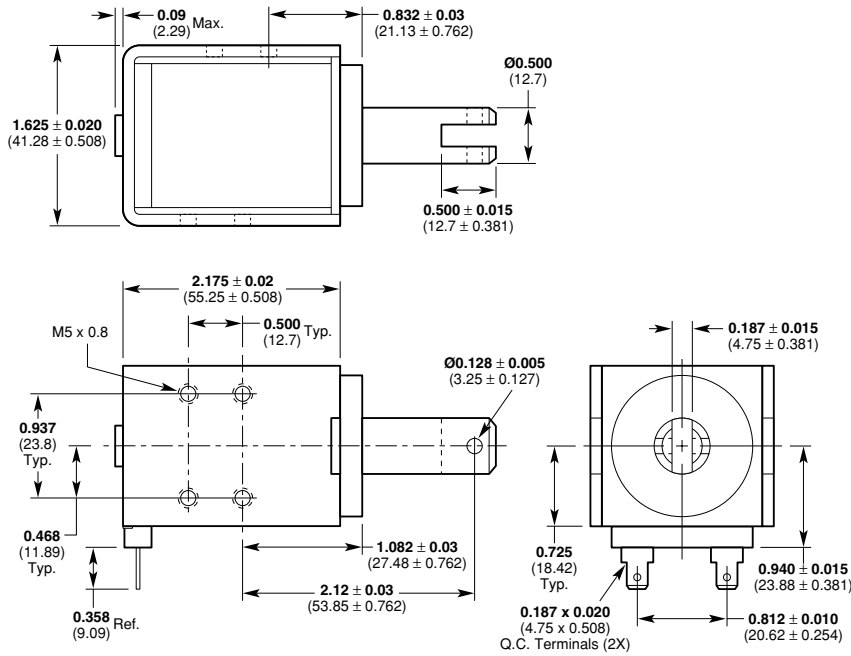
Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	52 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	66,6 g
Total Weight	382,7 g

Preferred Range

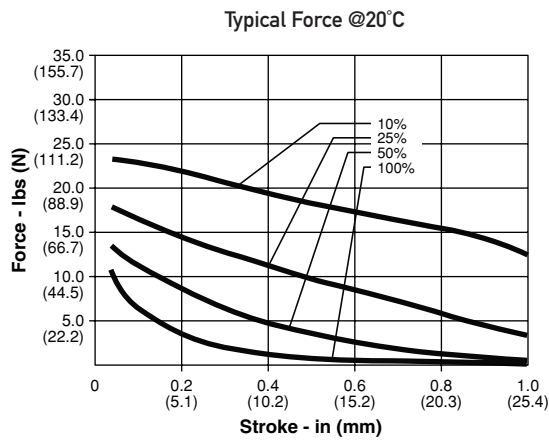
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
B4HDM-255-M-36	41 x 37 x 55 mm	6 VDC	100%	Box	Overmoulded	12,5 W @20°C	∞ sec

Open Frame B-4HDM

Dimensions



Performance chart



Open Frame B-4HDM

Ordering Reference

Type B4HDM-(XXX) Coil Data

Performance	100%	50%	25%	10%
Maximum ON Time (sec) when pulsed continuously	∞	83	34	13
Watts (@20°C)	12.5	25	50	125
Ampere Turns (@20°C)	1536	2174	3073	4860

Coil Data	Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number						
B4HDM-255-M-36	2.94	754	6	8.5	12	19
B4HDM-254-M-36	11.42	1467	12	17	24	38
B4HDM-253-M-36	46.83	2964	24	34	48	76
B4HDM-252-M-36	181	5724	48	68	96	152
B4HDM-251-M-36	1157	14239	120	170	240	380

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

B-11M

Linear Solenoid

Open Frame, DC

B-11M

Dimensions (mm)	30 x 24 x 47
Duty cycle	continuous or intermittent
Maximum Stroke	20,3 mm
Operation	DC
Typical Force (N)	4,4 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

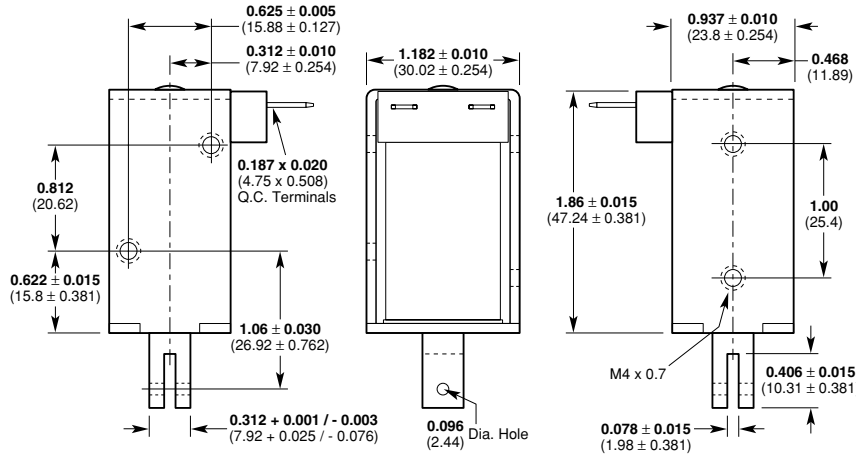
Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	21 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	17,3 g
Total Weight	145,4 g

Preferred Range

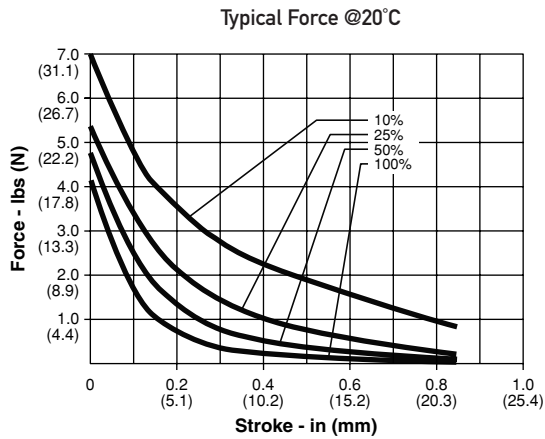
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
B11M-255-M-36	30 x 24 x 47 mm	6 VDC	100%	Box	Overmoulded	8,5 W @20°C	∞ sec

Open Frame B-11M

Dimensions



Performance chart



Open Frame B-11M

Ordering Reference

Type B11M-(XXX) Coil Data

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously		∞	50	16	6		
Watts (@20°C)		8.5	17	34	85		
Ampere Turns (@20°C)		1317	1866	3634	4170		
Coil Data		Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number							
B11M-255-M-36	4.12	916	6	8.5	12	19	
B11M-254-M-36	17.26	1881	12	17	24	38	
B11M-253-M-36	65.76	3601	24	34	48	76	
B11M-252-M-36	253.51	6930	48	68	96	152	
B11M-251-M-36	1538	16548	120	161	229	361	

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

B-16M

Linear Solenoid

Open Frame, DC

B-16M

Dimensions (mm)	13 x 10 x 34
Duty cycle	continuous or intermittent
Maximum Stroke	3,8 mm
Operation	DC
Typical Force (N)	4,1 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

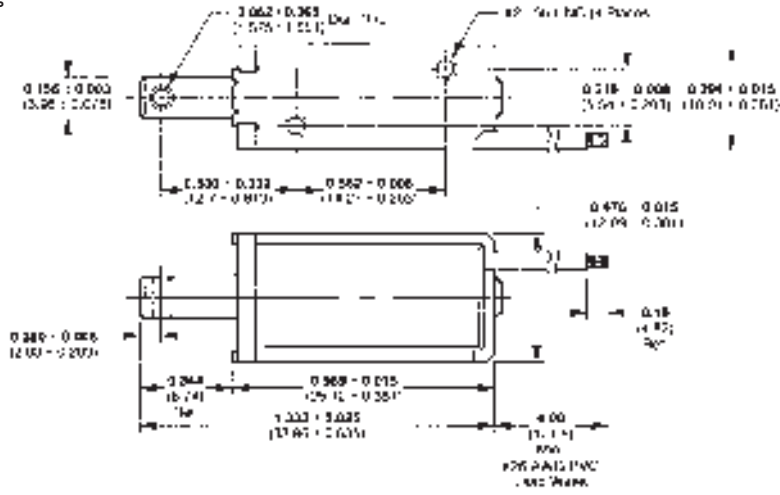
Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	4 N at 20°C
Coil Insulation	Class "B": 130°C max. temperature standard. Other temperature classes are available
Coil Termination	101 mm PVC lead wires
Plunger Weight	2,5 g
Total Weight	12,4 g

Preferred Range

Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
B16M-255-B-1	13 x 10 x 34 mm	24 VDC	100%	Box	Taped	1,4 W @20°C	∞ sec

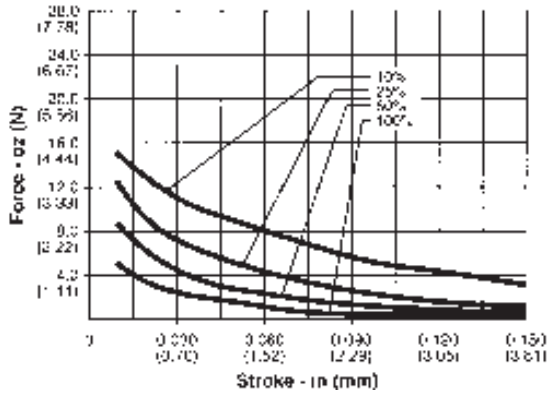
Open Frame B-16M

Dimensions



Performance chart

Typical Force @20°C



Open Frame B-16M

Ordering Reference

Type B16M-(XXX) Coil Data

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously		∞	40	15	5		
Watts (@20°C)		1.4	2.9	5.7	14.3		
Ampere Turns (@20°C)		270	383	575	855		
Coil Data		Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number							
B16M-255-M-36	22.71	1100	6	8.5	12	19	
B16M-254-M-36	100.79	2035	12	17	24	38	
B16M-253-M-36	394.5	3944	24	34	48	76	
B16M-252-M-36	1630	9827	48	68	96	152	

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Other coil terminations available.

B-17M

Linear Solenoid

Open Frame, DC

B-17M

Dimensions (mm)	13 x 15 x 24
Duty cycle	continuous or intermittent
Maximum Stroke	4,6 mm
Operation	DC
Typical Force (N)	2,1 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

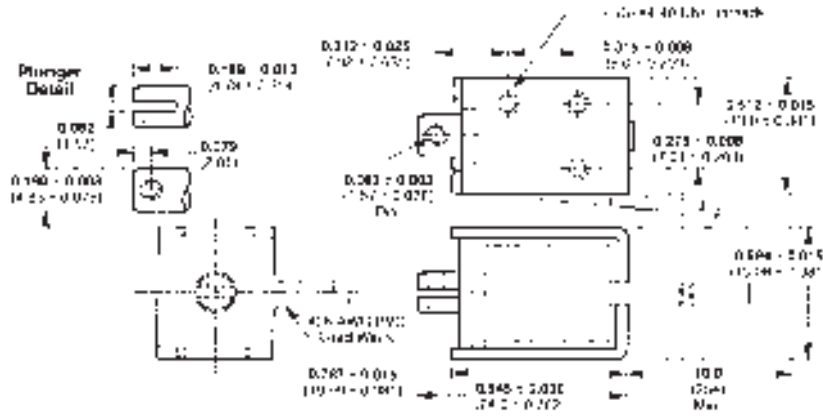
Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	3,9 N at 20°C
Coil Insulation	Class "B": 130°C max. temperature standard. Other temperature classes are available
Coil Termination	254 mm PVC lead wires
Plunger Weight	2,8 g
Total Weight	18,4 g

Preferred Range

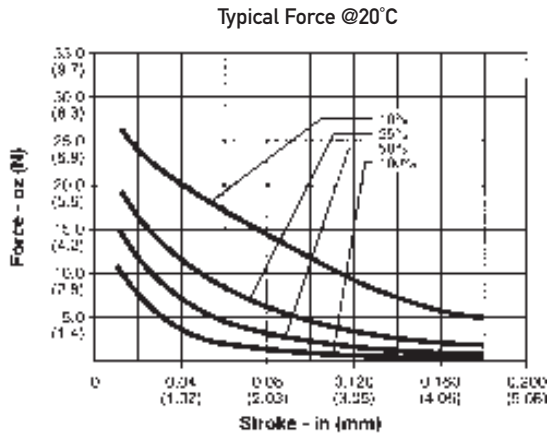
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
B17M-255-A-1	13 x 15 x 24 mm	24 VDC	100%	Box	Taped	1,6 W @20°C	∞ sec

Open Frame B-17M

Dimensions



Performance chart



Open Frame B-17M

Ordering Reference

Type B17M-(XXX) Coil Data

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously		∞	15	6	2		
Watts (@20°C)		1.6	3.2	6.4	16		
Ampere Turns (@20°C)		292	414	584	923		
Coil Data		Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number							
B17M-255-M-36	21.93	1112	6	8.5	12	19	
B17M-254-M-36	88.95	2219	12	17	24	38	
B17M-253-M-36	337	3687	24	34	48	76	
B17M-252-M-36	1465	9177	48	68	96	152	

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Other coil terminations available.

B-22M

Linear Solenoid

Open Frame, DC

B-22M

Dimensions (mm)	37 x 33 x 41
Duty cycle	continuous or intermittent
Maximum Stroke	25.4 mm
Operation	DC
Typical Force (N)	9.8 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



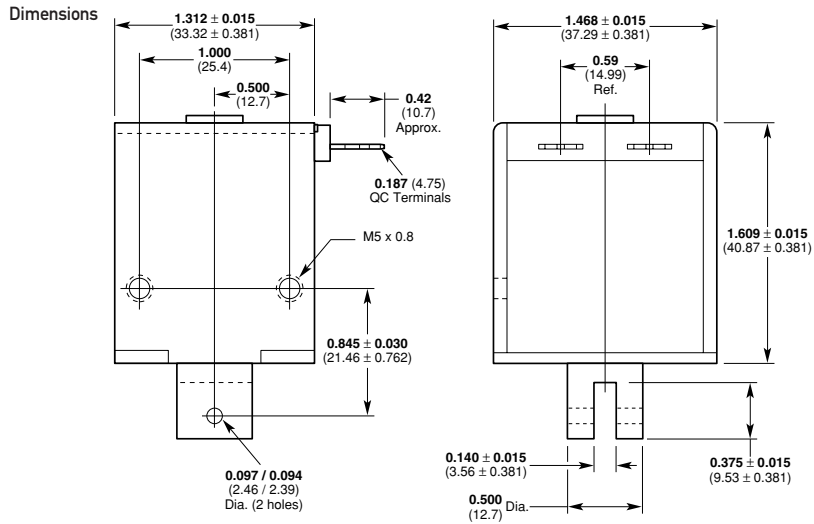
Technical Data

Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	55.2 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	39.7 g
Total Weight	212.6 g

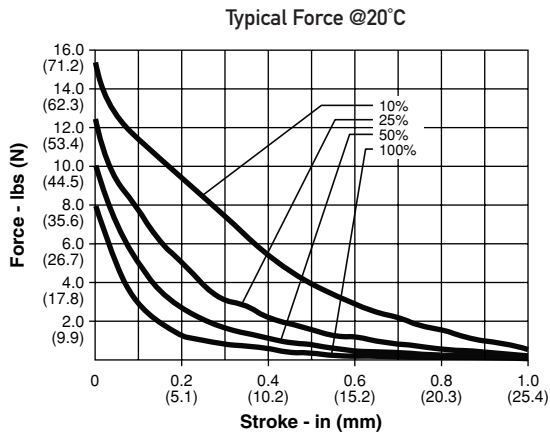
Preferred Range

Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
B22M-255-M-36	37 x 33 x 41 mm	6 VDC	100%	Box	Overmoulded	9.9 W @20°C	∞ sec

Open Frame B-22M



Performance chart



Open Frame B-22M

Ordering Reference

Type B22M-(XXX) Coil Data

Performance		100%	50%	25%	10%	
Maximum ON Time (sec) when pulsed continuously		∞	52	23	9	
Watts (@20°C)		9.9	19.8	39.6	99	
Ampere Turns (@20°C)		1046	1482	2093	3314	
Coil Data	Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
B22M-255-M-36	3.64	635	6	8.5	12	19
B22M-254-M-36	14.55	1300	12	17	24	38
B22M-253-M-36	58.18	2578	24	34	48	76
B22M-252-M-36	232.73	5103	48	68	96	152
B22M-251-M-36	1493	12744	120	172	240	385

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

B-41M

Linear Solenoid

Open Frame, DC

B-41M

Dimensions (mm)	44 x 51,5 x 77,5
Duty cycle	continuous or intermittent
Maximum Stroke	25,4 mm
Operation	DC
Typical Force (N)	44,5 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

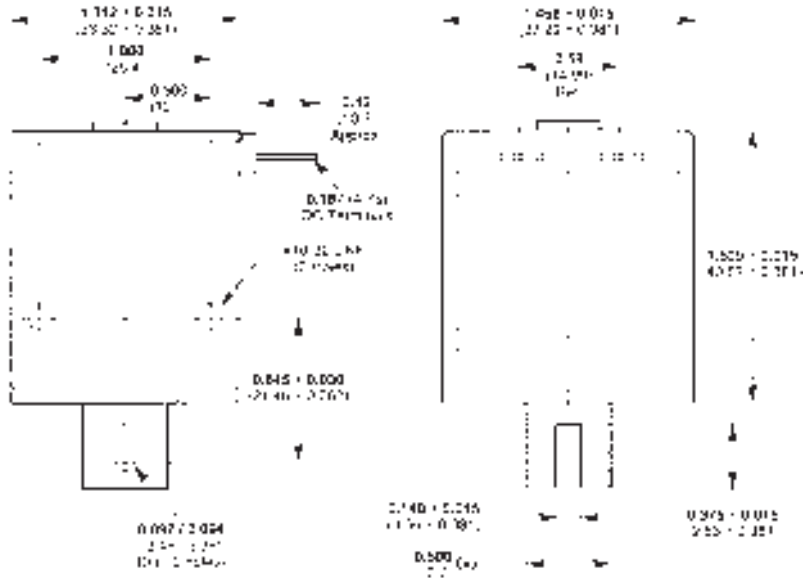
Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	117 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	Solden lugs
Plunger Weight	15,9 g
Total Weight	87,8 g

Preferred Range

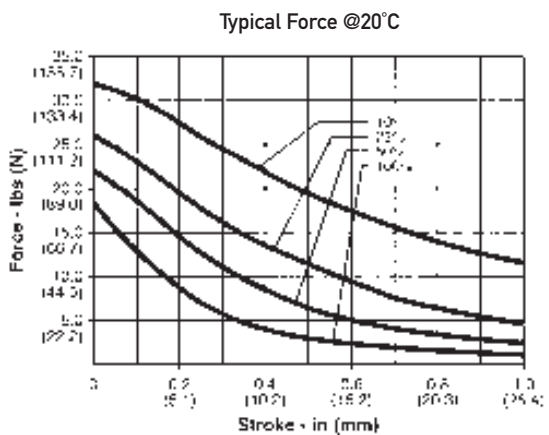
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
B41M-255-B-1	44 x 51,5 x 77,5 mm	24 VDC	100%	Box	Overmoulded	19 W @20°C	∞ sec

Open Frame B-41M

Dimensions



Performance chart



Open Frame B-41M

Ordering Reference

Type B41M-(XXX) Coil Data

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously		∞	95	60	14		
Watts (@20°C)		19	38	76	190		
Ampere Turns (@20°C)		1981	2807	3963	6274		
Coil Data		Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number							
B41M-255-M-36	1.84	608	6	8.5	12	19	
B41M-254-M-36	7.67	1432	12	17	24	38	
B41M-253-M-36	30.19	2814	24	34	48	76	
B41M-252-M-36	121.5	5610	48	68	96	152	

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Other coil terminations available.

C-8M

Linear Solenoid

Open Frame, DC

C-8M

Dimensions (mm)	21 x 19 x 29
Duty cycle	continuous or intermittent
Maximum Stroke	12.7 mm
Operation	DC
Typical Force (N)	1.1 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

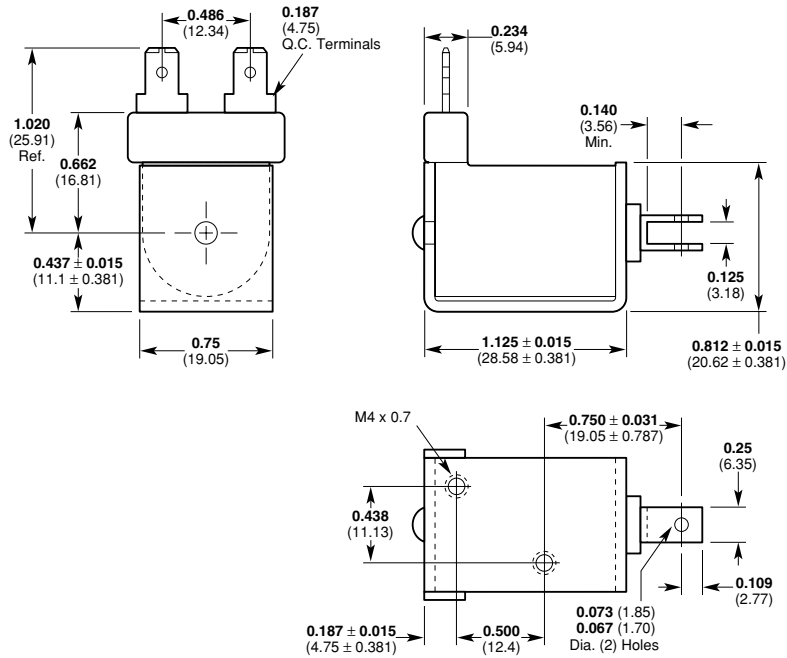
Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	9.96 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	10.2 g
Total Weight	45.4 g

Preferred Range

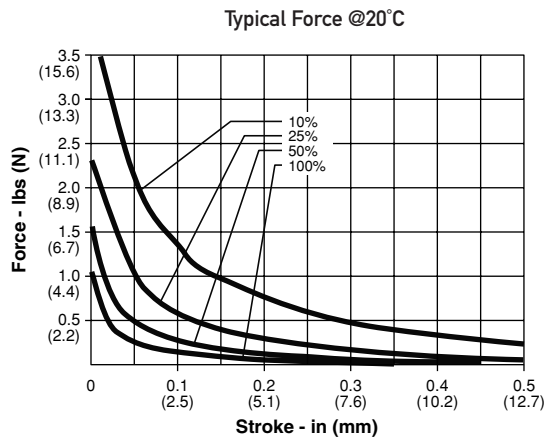
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
C8M-273-M-36	21 x 19 x 29 mm	6 VDC	100%	C Frame	Overmoulded	3,6 W @20°C	∞ sec

Open Frame C-8M

Dimensions



Performance chart



Open Frame C-8M

Ordering Reference

Type C8M-(XXX) Coil Data

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously		∞	19	9	3		
Watts (@20°C)		3.6	7	14	35		
Ampere Turns (@20°C)		464	657	929	1470		
Coil Data		Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number							
C8M-273-M-36	9.30	798	6	8.5	12	19	
C8M-272-M-36	37.12	1581	12	17	24	38	
C8M-271-M-36	150.73	2736	24	34	48	76	
C8M-270-M-36	621.54	5544	48	68	96	152	
C8M-269-M-36	3824	16011	120	164	231	366	

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-9M

Linear Solenoid

Open Frame, DC

C-9M

Dimensions (mm)	41 x 35 x 27
Duty cycle	continuous or intermittent
Maximum Stroke	12.7 mm
Operation	DC
Typical Force (N)	4.4 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

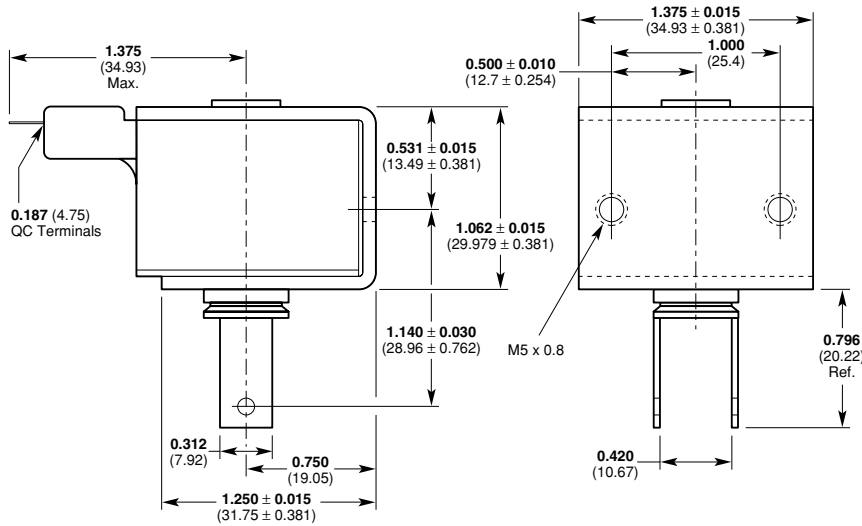
Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	19.6 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	21.8 g
Total Weight	128.7 g

Preferred Range

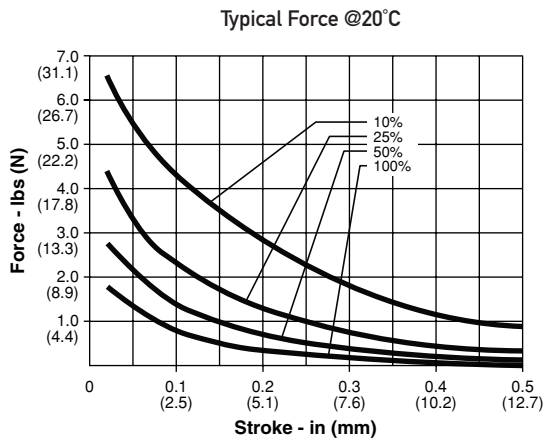
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
C9M-273-M-36	41 x 35 x 27 mm	6 VDC	100%	C Frame	Overmoulded	7 W @20°C	∞ sec

Open Frame C-9M

Dimensions



Performance chart



Open Frame C-9M

Ordering Reference

Type C9M-(XXX) Coil Data

Performance		100%	50%	25%	10%	
Maximum ON Time (sec) when pulsed continuously		∞	38	17	4	
Watts (@20°C)		7	14	28	70	
Ampere Turns (@20°C)		721	1022	1444	2286	
Coil Data	Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number						
C9M-273-M-36	5.05	648	6	8.5	12	19
C9M-272-M-36	19.88	1275	12	17	24	38
C9M-271-M-36	78.41	2502	24	34	48	76
C9M-270-M-36	338.48	4641	48	68	96	152
C9M-269-M-36	2081	11187	120	170	240	381

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-15M

Linear Solenoid

Open Frame, DC

C-15M

Dimensions (mm)	28 x 27 x 29
Duty cycle	continuous or intermittent
Maximum Stroke	12.7 mm
Operation	DC
Typical Force (N)	2.7 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

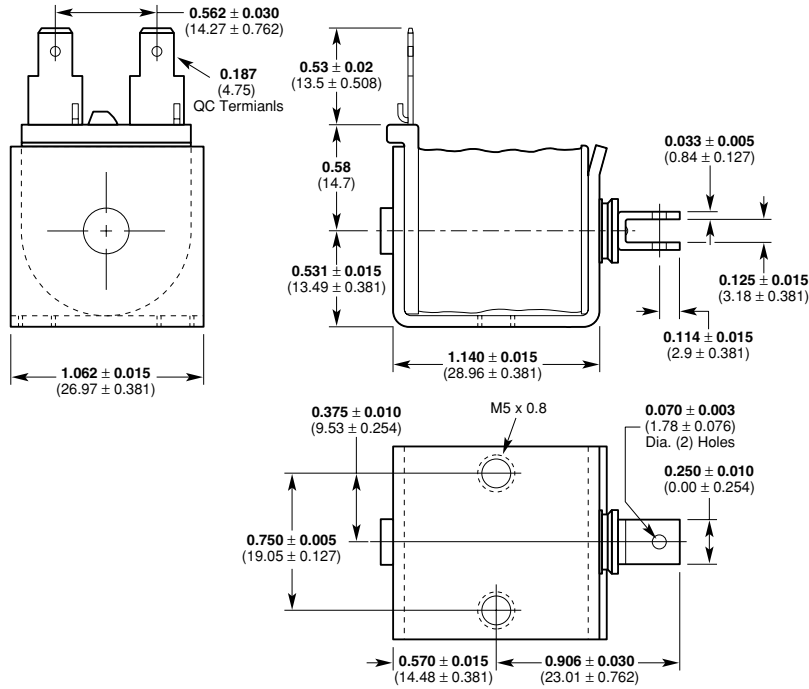
Continuous Duty Cycle	At 20°C ambient temperature
Holding Force	12.05 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature, standard
Coil Termination	3/16" QC
Plunger Weight	14,5 g
Total Weight	71,4 g

Preferred Range

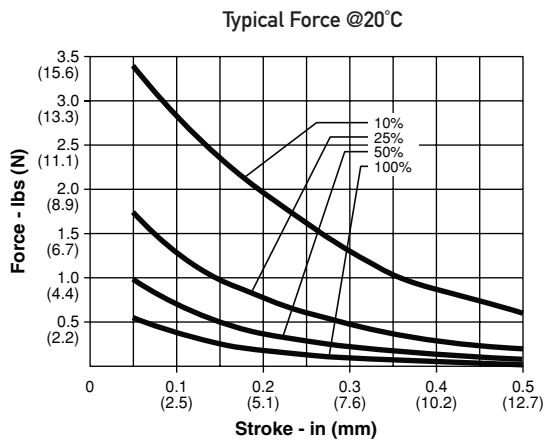
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
C15M-273-B-36	28 x 27 x 29 mm	6 VDC	100%	C Frame	Taped	4,5 W @20°C	∞ sec

Open Frame C-15M

Dimensions



Performance chart



Open Frame C-15M

Ordering Reference

Type C15M-(XXX) Coil Data

Performance		100%	50%	25%	10%	
Maximum ON Time (sec) when pulsed continuously		∞	28	11	4	
Watts (@20°C)		4.5	9	18	45	
Ampere Turns (@20°C)		617	870	1229	1947	
Coil Data	Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
C15M-273-B-36	7.77	855	6	8.5	12	19
C15M-272-B-36	32.42	1749	12	17	24	38
C15M-271-B-36	123.02	3330	24	33	48	74
C15M-270-B-36	514	5985	48	68	96	152
C15M-269-B-36	3106	14690	120	170	240	381

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-26M

Linear Solenoid

Open Frame, DC

C-26M

Dimensions (mm)	29 x 22 x 44
Duty cycle	continuous or intermittent
Maximum Stroke	19 mm
Operation	DC
Typical Force (N)	2.2 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

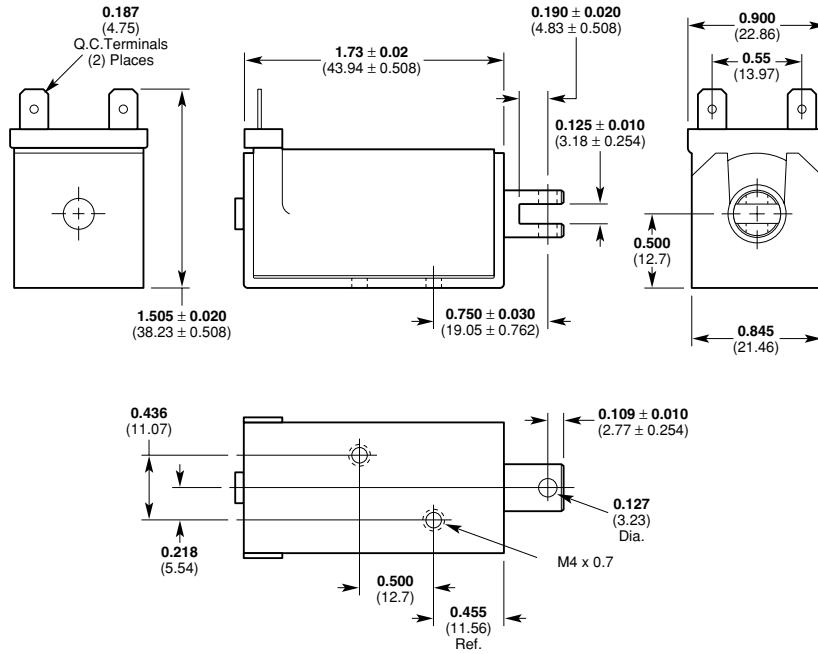
Continuous Duty Cycle	100% at 20°C ambient temperature
Holding Force	13.21 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	14.2 g
Total Weight	87.6 g

Preferred Range

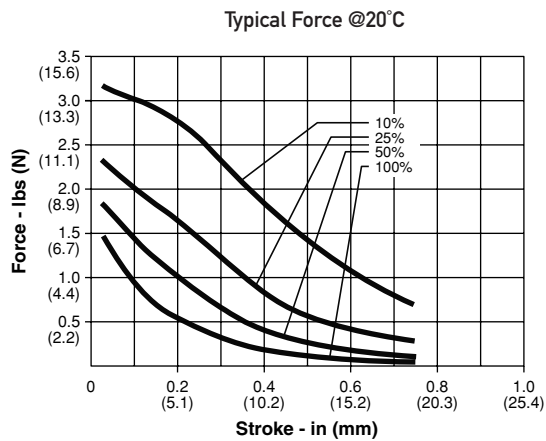
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
C26M-273-M-36	29 x 22 x 44 mm	6 VDC	100%	C Frame	Overmoulded	7 W @20°C	∞ sec

Open Frame C-26M

Dimensions



Performance chart



Open Frame C-26M

Ordering Reference

Type C26M-(XXX) Coil Data

Performance		100%	50%	25%	10%	
Maximum ON Time (sec) when pulsed continuously		∞	31	14	5	
Watts (@20°C)		7	14	28	70	
Ampere Turns (@20°C)		963	1364	1926	3050	
Coil Data	Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number						
C26M-273-M-36	5.45	874	6	8.5	12	19
C26M-272-M-36	20.75	1672	12	17	24	38
C26M-271-M-36	81.13	3255	24	34	48	76
C26M-270-M-36	311.42	6235	48	68	96	152
C26M-269-M-36	2092	14117	120	171	240	382

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-33M

Linear Solenoid

Open Frame, DC

C-33M

Dimensions (mm)	29 x 33 x 34
Duty cycle	continuous or intermittent
Maximum Stroke	12.7 mm
Operation	DC
Typical Force (N)	4.9 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

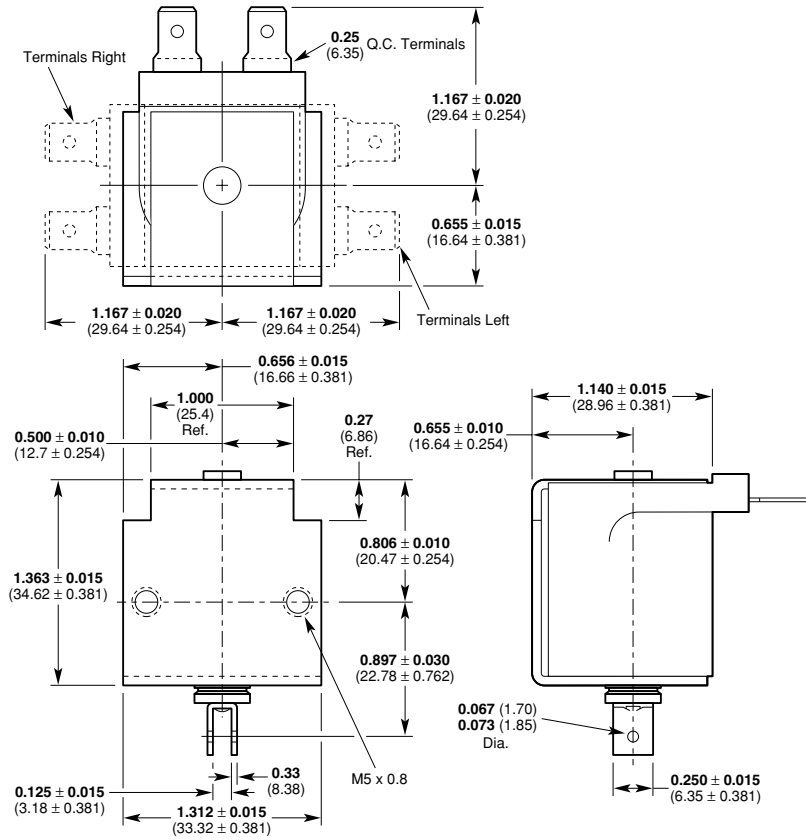
Continuous Duty Cycle	At 20°C ambient temperature.
Holding Force	19.66 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	1/4" QC
Plunger Weight	14.2 g
Total Weight	111.7 g

Preferred Range

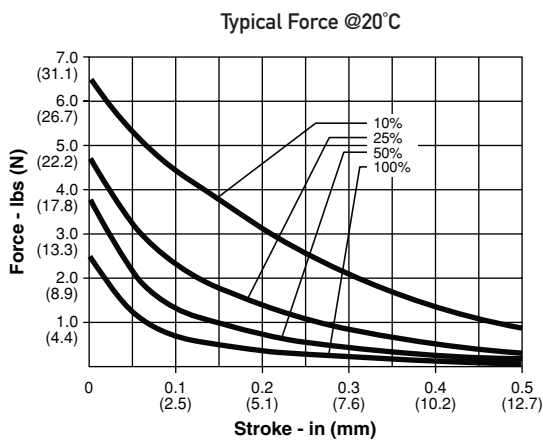
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time" (sec)
C33M-273-M-33	29 x 33 x 34 mm	6 VDC	100%	C Frame	Overmoulded	7 W @20°C	∞ sec

Open Frame C-33M

Dimensions



Performance chart



Open Frame C-33M

Ordering Reference

Type C33M-(XXX) Coil Data

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously		∞	38	16	6		
Watts (@20°C)		7	14	28	70		
Ampere Turns (@20°C)		828	1172	1656	2622		
Coil Data		Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number							
C33M-273-M-33	5.38	747	6	8.5	12	19	
C33M-272-M-33	21.00	1458	12	17	24	38	
C33M-271-M-33	81.20	2812	24	34	48	76	
C33M-270-M-33	329.25	5616	48	68	96	152	
C33M-269-M-33	2043	13623	120	169	240	378	

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-34M

Linear Solenoid

Open Frame, DC

C-34M

Dimensions (mm)	37 x 33 x 42
Duty cycle	continuous or intermittent
Maximum Stroke	25.4 mm
Operation	DC
Typical Force (N)	4.4 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; DC activated; continuous or intermittent duty; on/off operation



Technical Data

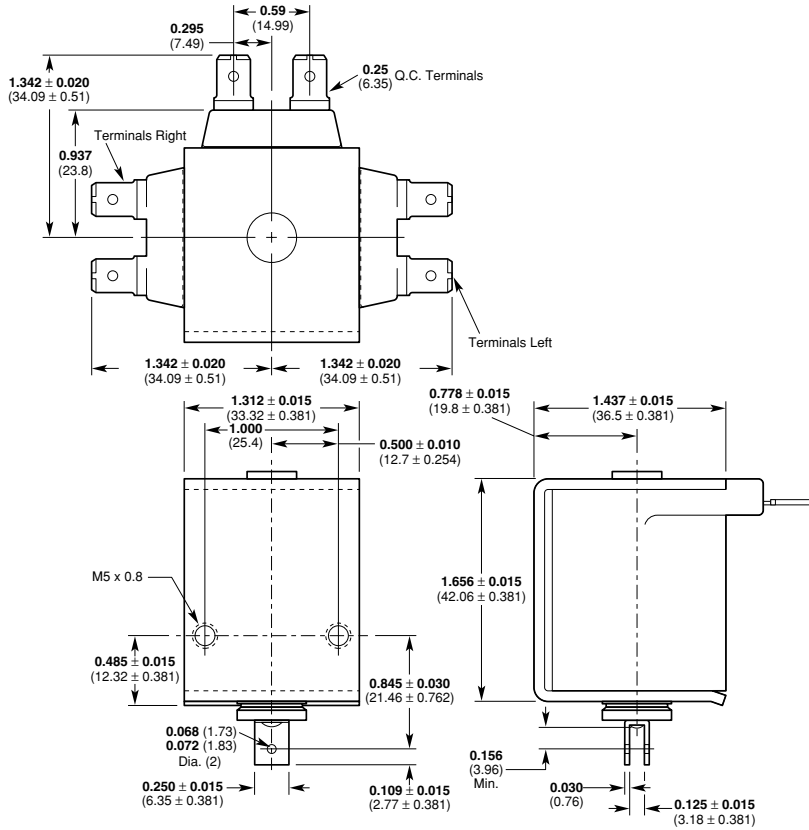
Continuous Duty Cycle	At 20°C ambient temperature
Holding Force	30.2 N at 20°C
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	1/4" QC
Plunger Weight	34.9 g
Total Weight	192.8 g

Preferred Range

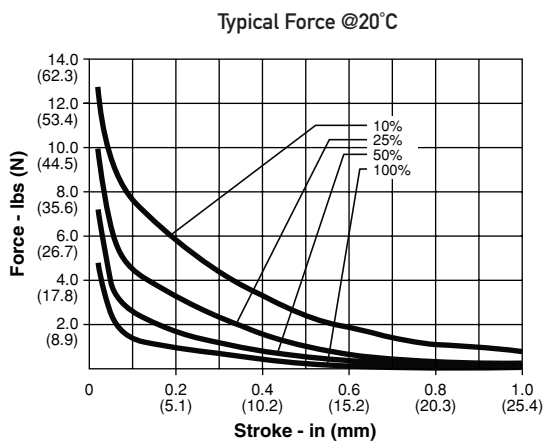
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	Nominal power	max. "On time"
C34M-273-M-36	37 x 33 x 42 mm	6 VDC	100%	C Frame	Overmoulded	10 W @20°C	∞ sec

Open Frame C-34M

Dimensions



Performance chart



Open Frame C-34M

Ordering Reference

Type C34M-(XXX) Coil Data

Performance		100%	50%	25%	10%		
Maximum ON Time (sec) when pulsed continuously		∞	45	20	7		
Watts (@20°C)		10	20	40	100		
Ampere Turns (@20°C)		1188	1684	2377	3763		
Coil Data		Resistance (@20°C)	Ref # Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
Part Number							
C34M-273-M-33	3.64	721	6	8.5	12	19	
C34M-272-M-33	14.47	1224	12	17	17	38	
C34M-271-M-33	57.65	2424	24	34	48	76	
C34M-270-M-33	229.17	4777	48	68	96	152	
C34M-269-M-33	1428	11907	120	169	240	378	

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

Linear Solenoids

Open Frame	Type	Preferred Products	Page
AC Operation	B-75M	B75M-3000	200
	B-4HDM	B4HDM-50-M-36	203
	B-11M	B11M-50-M-36	206
	B-22M	B22M-50-M-36	209
	C-8M	C8M-50-M-36	212
	C-9M	C9M-50-M-36	215
	C-15M	C15M-50-B-14	218
	C-26M	C26M-50-M-36	221
	C-33M	C33M-50-M-33	224
	C-34M	C34M-50-M-36	227

B-75M

Linear Solenoid

Open Frame, AC

B-75M

Dimensions (mm)	29 x 28 x 41.5
Duty cycle	continuous or intermittent
Maximum Stroke	12 mm
Operation	AC
Typical Force (N)	12 N (@5% Duty Cycle /230 VAC/11 mm stroke)
Life	100 000 cycles
Housing	Compact box frame design with tapped mounting holes
Functional Advantages	AC activated; continuous or intermittent duty pull-in/push out engagement and built in thermal protector available. different plunger and assembly designs possible



Technical Data

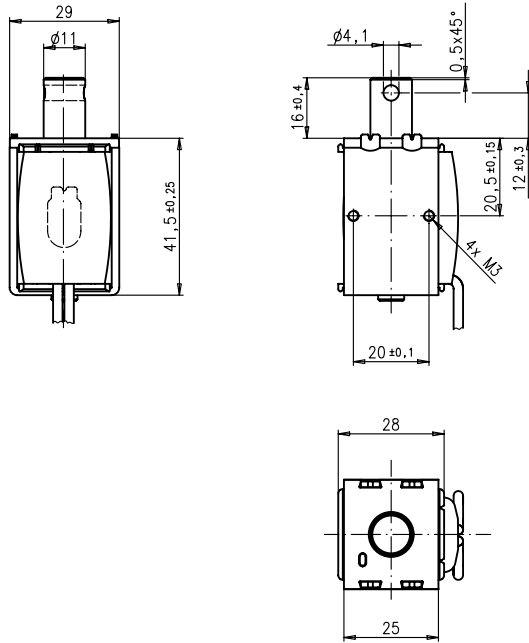
Max ambient temperature	50°C
Holding Force	20 N at 20°C (100% duty cycle, 230 VAC)
Insulation class	Class "B": 130°C max. temperature
Basic Insulation	EN 60335-1
Coil Termination	lead wires
Plunger Weight	30 g
Total Weight	160 g

Preferred Range

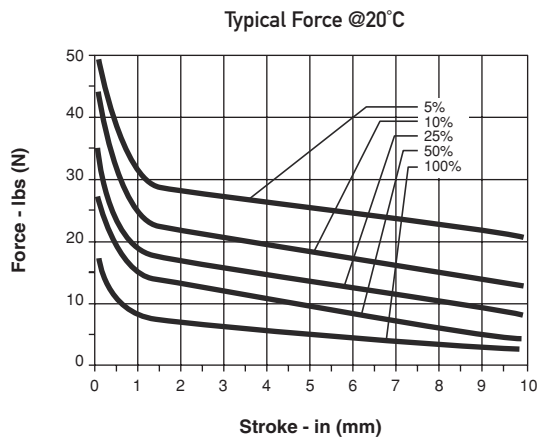
Type	Size	Nominal voltage	Duty Cycle	Frame Type	Coil Type	max. "On time"
B75M-3000	29 x 28 x 41.5 mm	230 VAC	5%	Box	Taped	0,8 sec

Open Frame B-75M

Dimensions



Performance chart



B-4HDM

Linear Solenoid

Open Frame, AC

B-4HDM

Dimensions (mm)	41 x 37 x 55
Duty cycle	continuous or intermittent
Maximum Stroke	25,4 mm
Operation	AC
Typical Force (N)	22,2 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



Technical Data

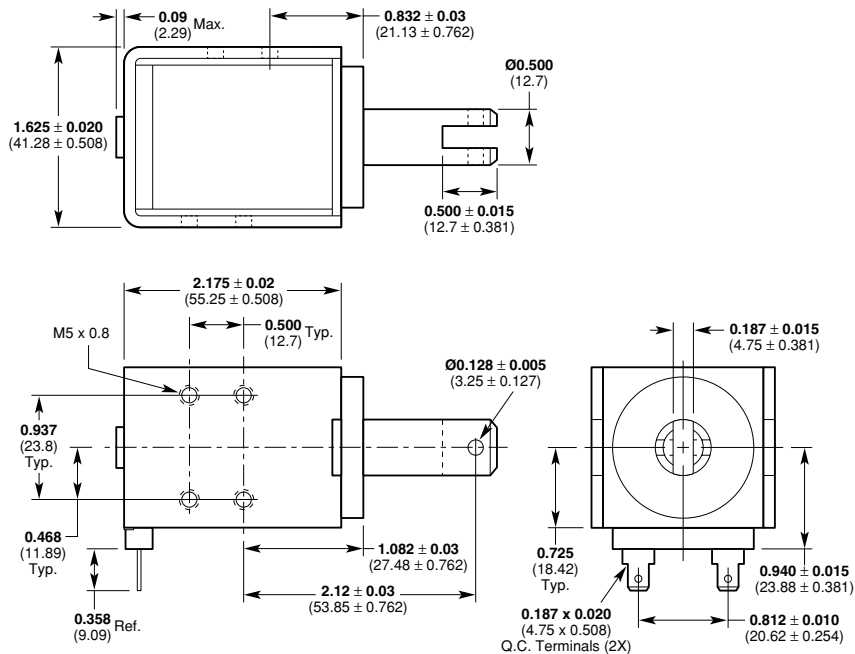
Continuous Duty Cycle	100% at 20°C ambient temperature
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	43.7 g
Total Weight	226.2 g

Preferred Range

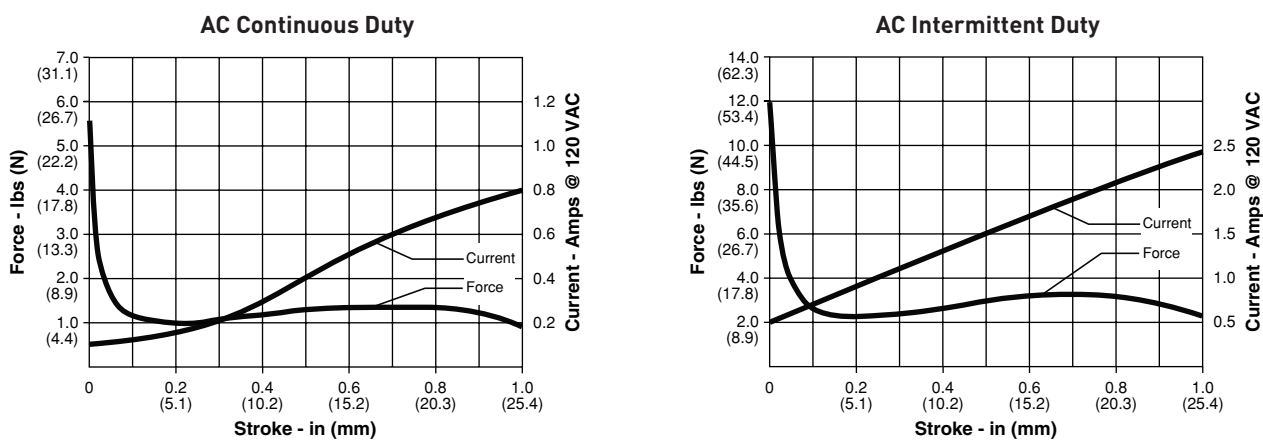
Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
B4HDM-50-M-36	41 x 37 x 55 mm	230 VAC	Continuous – 145 VA	Box	Overmoulded	20% on time

Open Frame B-4HDM

Dimensions



Performance chart



Open Frame B-4HDM

Ordering Reference

Type B4HDM-50-M-36/B4HDM-502-M-36

Duty Cycle	Continuous – 31 VA	Intermittent – 145 VA
Type	B4HDM-50-M-36	B4HDM-502-M-36
Volts — 50Hz	230	230
Coil Resistance ± 10% (Ohms at 25°C)	292	77

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

B-11M

Linear Solenoid

Open Frame, AC

B-11M

Dimensions (mm)	30 x 24 x 47
Duty cycle	continuous or intermittent
Maximum Stroke	25.4 mm
Operation	AC
Typical Force (N)	5.8 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



Technical Data

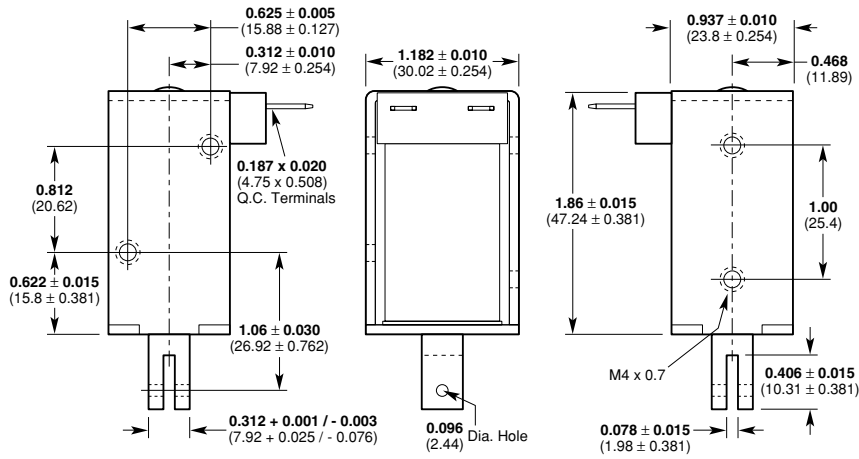
Continuous Duty Cycle	100% at 20°C ambient temperature
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	16.7 g
Total Weight	144 g

Preferred Range

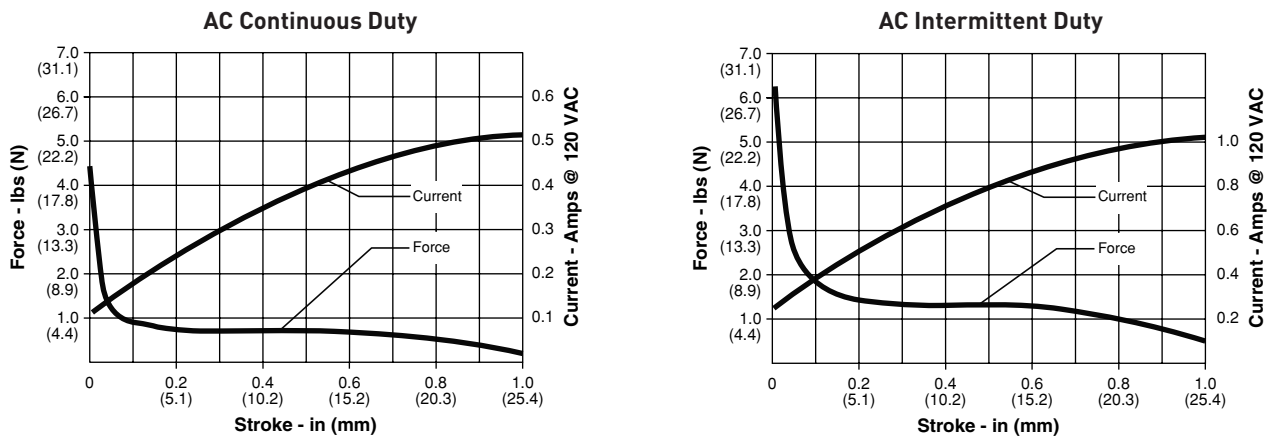
Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
B11M-50-M-36	30 x 24 x 47 mm	230 VAC	Intermittent – 40 VA	Box	Overmoulded	20% on time

Open Frame B-11M

Dimensions



Performance chart



Open Frame B-11M

Ordering Reference

Type B11M-50-M-36
B11M-502-M-36

Duty Cycle	Continuous – 12 VA	Intermittent – 40 VA
Type	B11-50-M-36	B11-502-M-36
Volts — 50Hz	230	230
Coil Resistance \pm 10% (Ohms at 25°C)	796	378

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

B-22M

Linear Solenoid

Open Frame, AC

B-22M

Dimensions (mm)	37 x 33 x 41
Duty cycle	continuous or intermittent
Maximum Stroke	25.4 mm
Operation	AC
Typical Force (N)	11,6 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact box frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



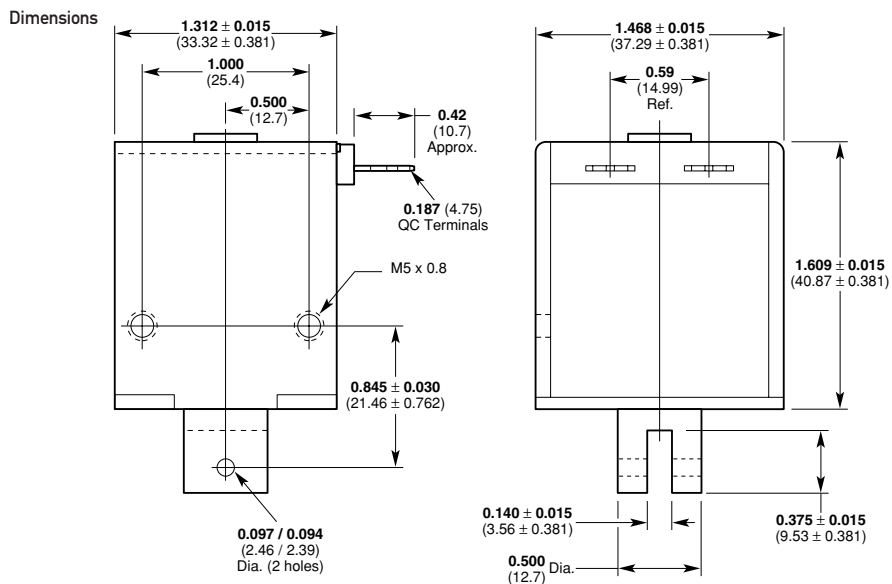
Technical Data

Continuous Duty Cycle	100% at 20°C ambient temperature
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	43.7 g
Total Weight	226.2 g

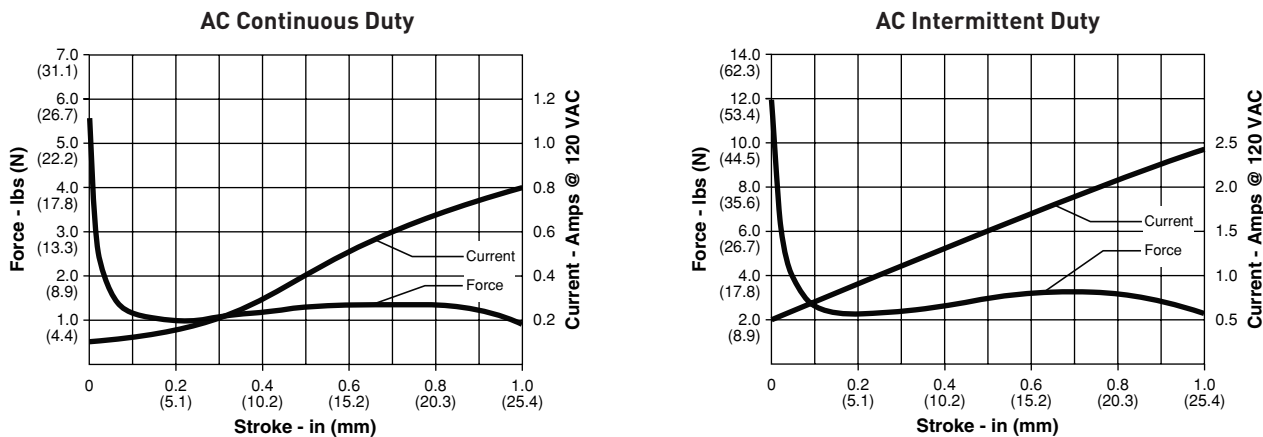
Preferred Range

Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
B22M-50-M-36	37 x 33 x 41 mm	230 VAC	Intermittent – 40 VA	Box	Overmoulded	20% on time

Open Frame B-22M



Performance chart



Open Frame B-22M

Ordering Reference

Type B22M-50-M-36
B22M-502-M-36

Duty Cycle	Continuous – 12 VA	Intermittent – 40 VA
Type	B22-50-M-36	B22-502-M-36
Volts — 50Hz	230	230
Coil Resistance \pm 10% (Ohms at 25°C)	471	179

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-8M

Linear Solenoid

Open Frame, AC

C-8M

Dimensions (mm)	21 x 19 x 29
Duty cycle	continuous or intermittent
Maximum Stroke	12.7 mm
Operation	AC
Typical Force (N)	1.8 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



Technical Data

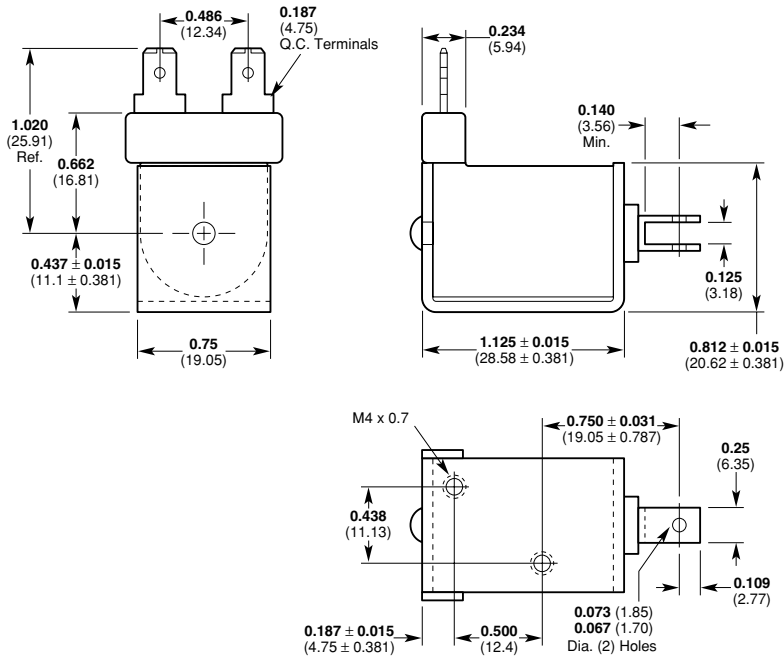
Continuous Duty Cycle	100% at 20°C ambient temperature
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	9.9 g
Total Weight	48.2 g

Preferred Range

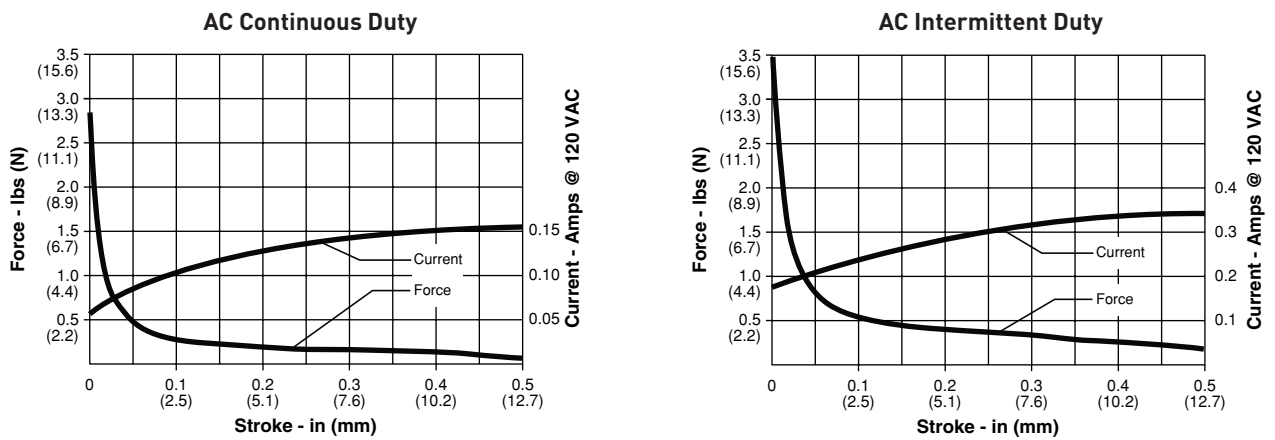
Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
C8M-50-M-36	21 x 19 x 29 mm	230 VAC	Intermittent – 19 VA	C Frame	Overmoulded	20% on time

Open Frame C-8M

Dimensions



Performance chart



Open Frame C-8M

Ordering Reference

Type C8M-50-M-36
C8M-520-M-36

Duty Cycle	Continuous – 6.5 VA	Intermittent – 19 VA
Type	C8-50-M-36	C8-520-M-3
Volts — 50Hz	230	230
Coil Resistance \pm 10% (Ohms at 25°C)	3325	2010

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-9M

Linear Solenoid

Open Frame, AC

C-9M

Dimensions (mm)	31 x 35 x 27
Duty cycle	continuous or intermittent
Maximum Stroke	12.7 mm
Operation	AC
Typical Force (N)	11.1 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



Technical Data

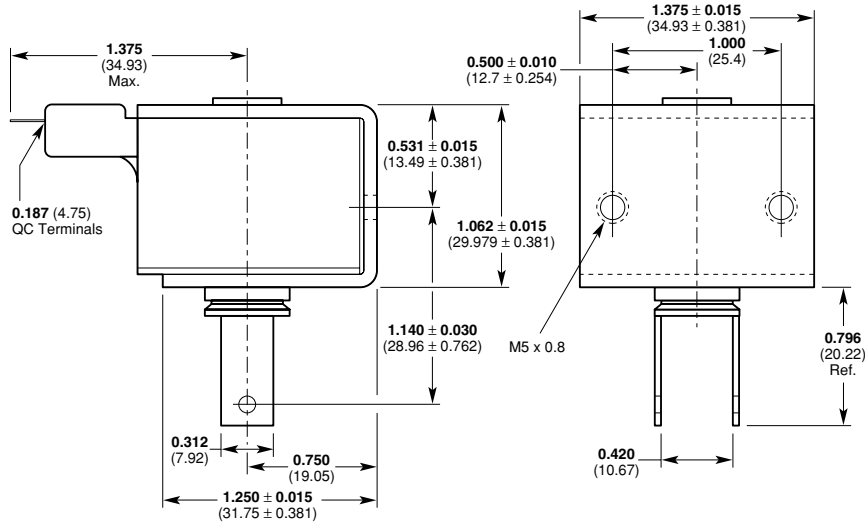
Continuous Duty Cycle	100% at 20°C ambient temperature
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	25.2 g
Total Weight	134.1 g

Preferred Range

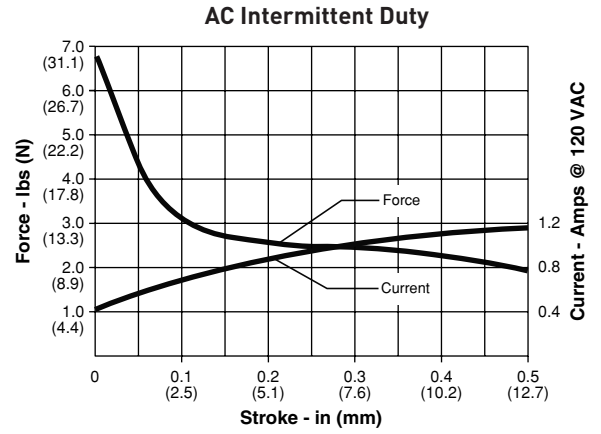
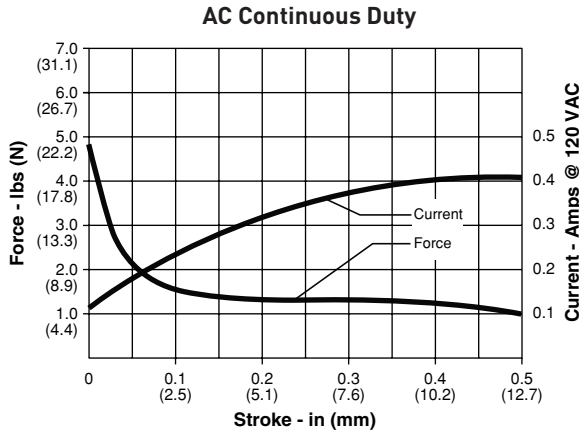
Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
C9M-50-M-36	41 x 35 x 27 mm	230 VAC	Intermittent – 50 VA	C Frame	Overmoulded	20% on time

Open Frame C-9M

Dimensions



Performance chart



Open Frame C-9M

Ordering Reference

Type C9M-50-M-36
C9M-520-M-36

Duty Cycle	Continuous – 13 VA	Intermittent – 50 VA
Type	C9-50-M-36	C9-520-M-36
Volts — 50Hz	230	230
Coil Resistance ± 10% (Ohms at 25°C)	698	295

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-15M

Linear Solenoid

Open Frame, AC

C-15M

Dimensions (mm)	25 x 27 x 29
Duty cycle	continuous or intermittent
Maximum Stroke	12.7 mm
Operation	AC
Typical Force (N)	3,6 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



Technical Data

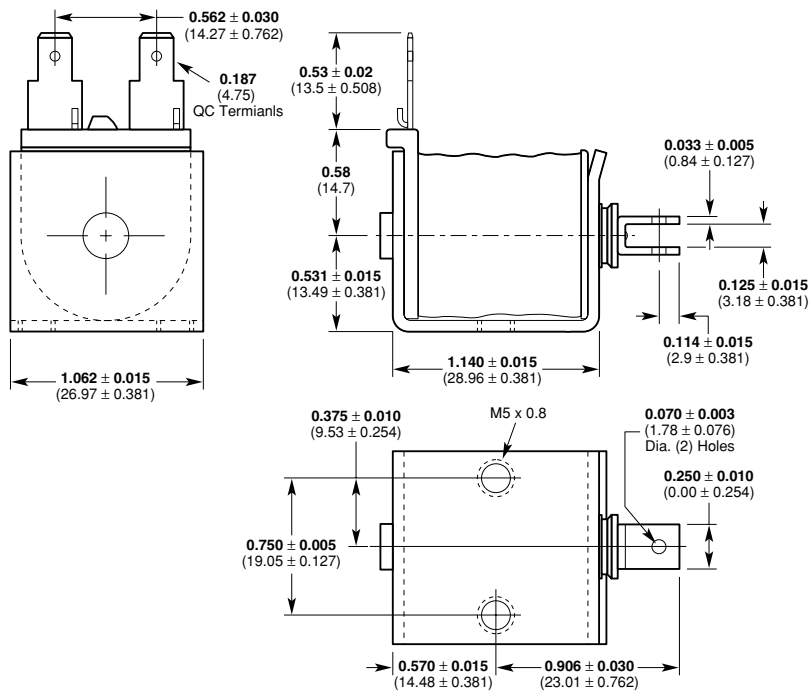
Continuous Duty Cycle	At 20°C ambient temperature
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	4.8 mm QC
Plunger Weight	14.5 g
Total Weight	70.9 g

Preferred Range

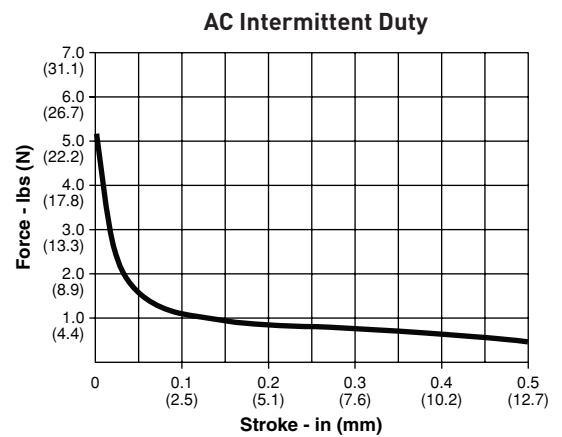
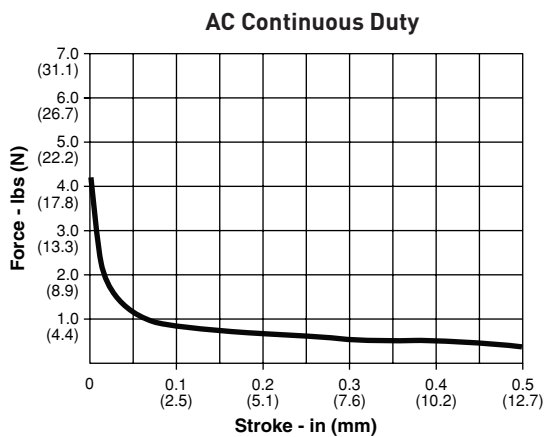
Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
C15M-50-B-14	28 x 27 x 29 mm	230 VAC	Intermittent – 24 VA	C Frame	Taped	20% on time

Open Frame C-15M

Dimensions



Performance chart



Open Frame C-15M

Ordering Reference

Type C15M-50-B-14
C15M-520-B-14

Duty Cycle	Continuous – 14 VA	Intermittent– 24 VA
Type	C15-50-B-14	C15-520-B-14
Volts — 50Hz	230	230
Coil Resistance ± 10% (Ohms at 25°C)	1450	880

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-26M

Linear Solenoid

Open Frame, AC

C-26M

Dimensions (mm)	26 x 22 x 44
Duty cycle	continuous or intermittent
Maximum Stroke	19.0 mm
Operation	AC
Typical Force (N)	3.1 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



Technical Data

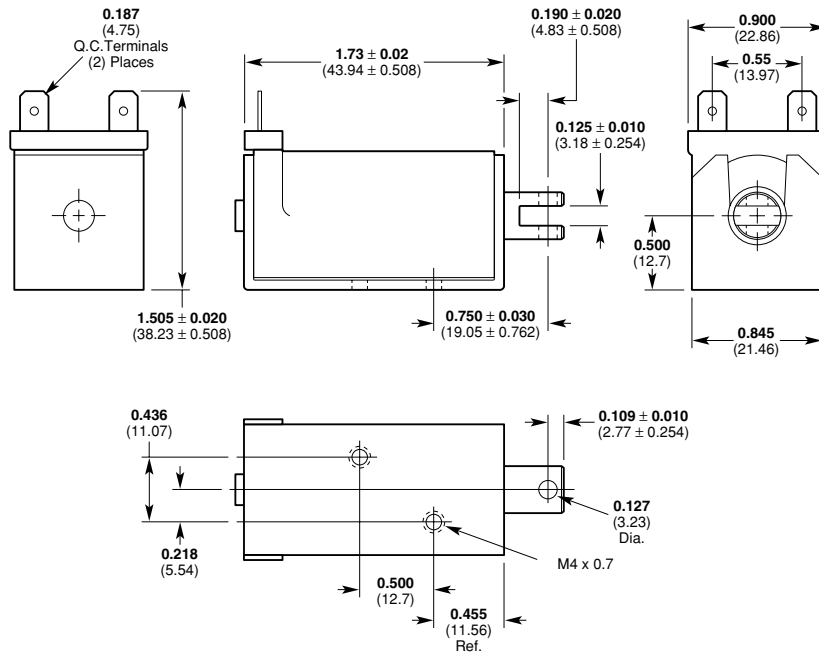
Continuous Duty Cycle	100% at 20°C ambient temperature
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	3/16" QC
Plunger Weight	13.3 g
Total Weight	85.6 g

Preferred Range

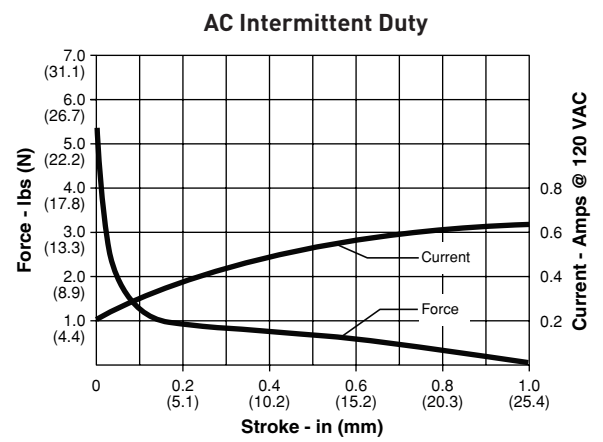
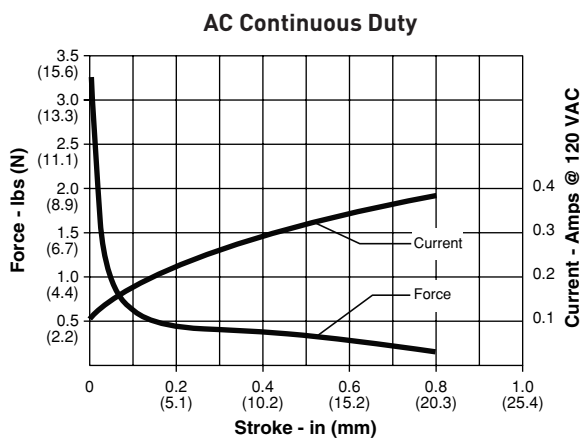
Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
C26M-50-M-36	29 x 22 x 44 mm	230 VAC	Intermittent – 24 VA	C Frame	Overmoulded	20% on time

Open Frame C-26M

Dimensions



Performance chart



Open Frame C-26M

Ordering Reference

Type C26M-50-M-36
C26M-520-M-36

Duty Cycle	Continuous – 12 VA	Intermittent – 24 VA
Type	C26-50-M-36	C26-520-M-36
Volts — 50Hz	230	230
Coil Resistance \pm 10% (Ohms at 25°C)	1000	560

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-33M

Linear Solenoid

Open Frame, AC

C-33M

Dimensions (mm)	29 x 33 x 34
Duty cycle	continuous or intermittent
Maximum Stroke	12,7 mm
Operation	AC
Typical Force (N)	5,3 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



Technical Data

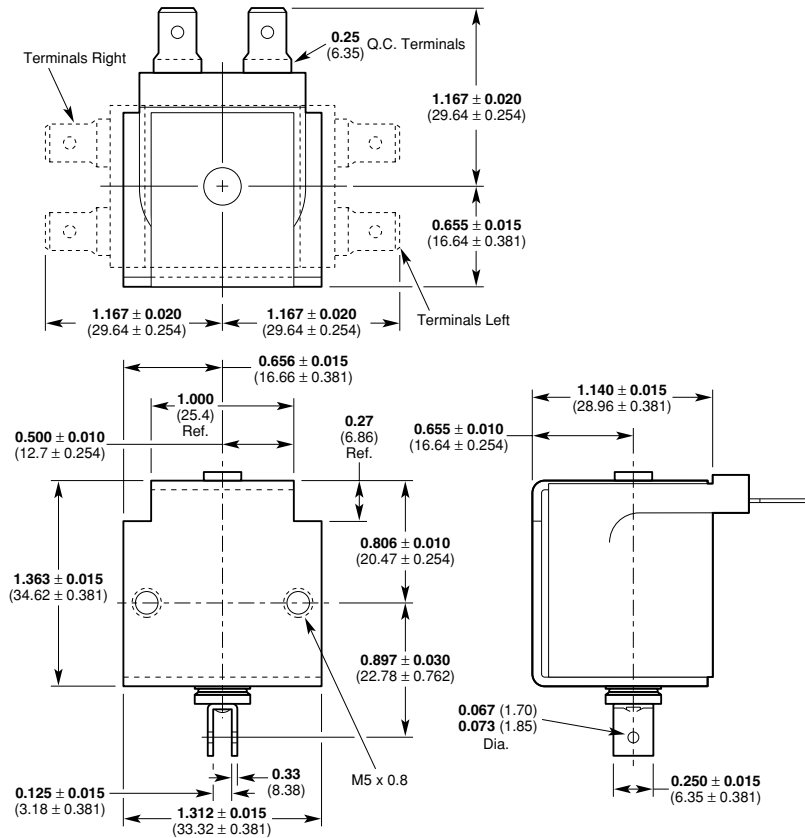
Continuous Duty Cycle	At 20°C ambient temperature.
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard. Other temperature classes are available
Coil Termination	1/4"QC
Plunger Weight	14,5 g
Total Weight	109,1 g

Preferred Range

Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
C33M-50-M-33	29 x 33 x 34 mm	230 VAC	Intermittent – 24 VA	C Frame	Overmoulded	20% on time

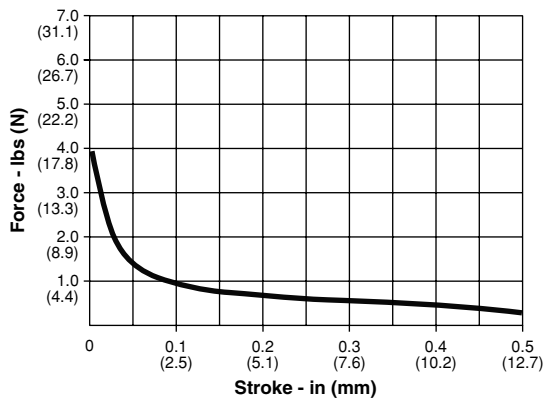
Open Frame C-33M

Dimensions

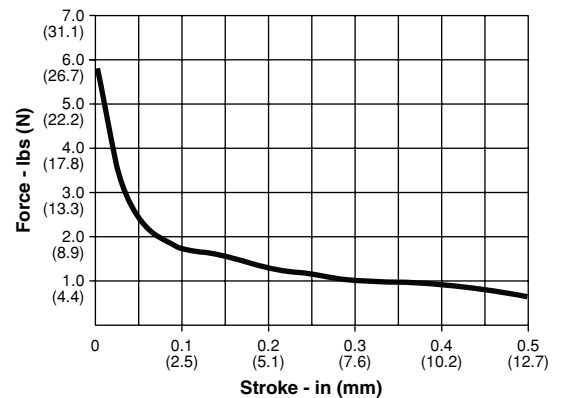


Performance chart

AC Continuous Duty



AC Intermittent Duty



Open Frame C-33M

Ordering Reference

Type C33M-50-M-33
C33M-520-M-33

Duty Cycle	Continuous – 17 VA	Intermittent – 24 VA
Type	C33-50-M-33	C33-520-M-33
Volts — 50Hz	230	230
Coil Resistance \pm 10% (Ohms at 25°C)	1156	652

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

C-34M

Linear Solenoid

Open Frame, AC

C-34M

Dimensions (mm)	37 x 33 x 42
Duty cycle	continuous or intermittent
Maximum Stroke	25.4 mm
Operation	AC
Typical Force (N)	9.3 N (@25% Duty Cycle / 100% Voltage maximum stroke)
Life	1 Mio cycles
Housing	Compact C frame designs with tapped mounting holes
Functional Advantages	Most economical design for volume applications; AC activated; continuous or intermittent duty; on/off operation



Technical Data

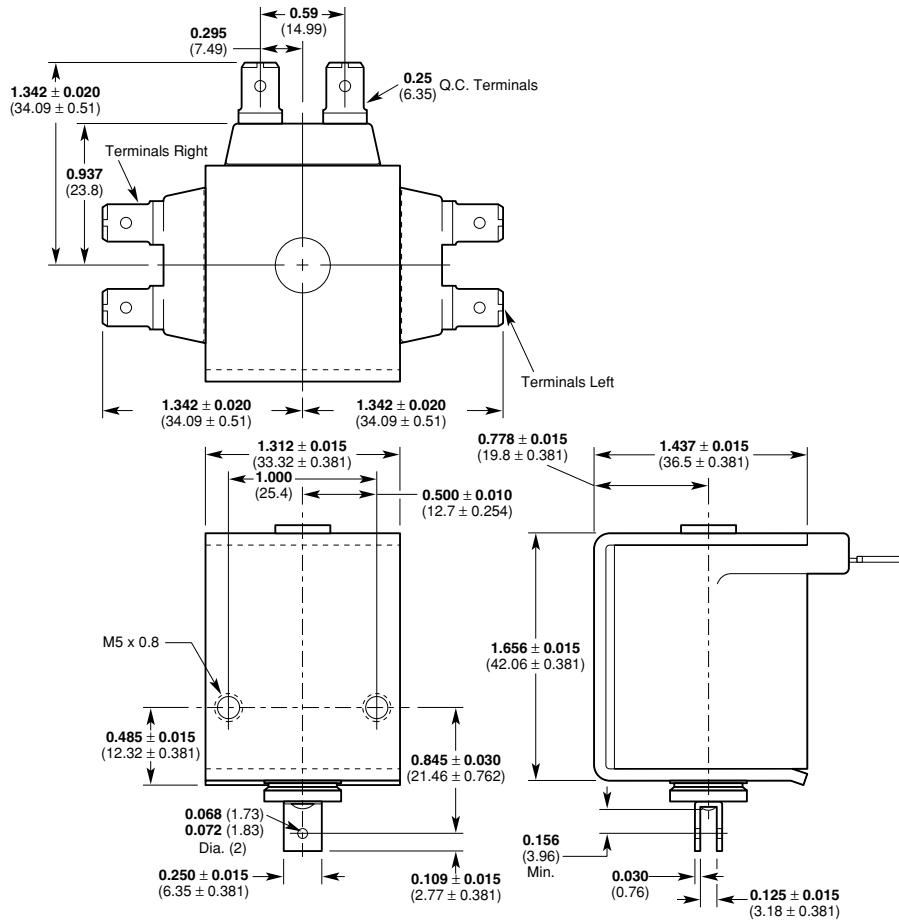
Continuous Duty Cycle	At 20°C ambient temperature
Intermittent Duty Cycle	20% on time, 80% off time. On time not to exceed 3 min. at 20°C ambient temperature
Coil Insulation	Class "A": 105°C max. temperature standard
Coil Termination	1/4" QC
Plunger Weight	38.3 g
Total Weight	192.8 g

Preferred Range

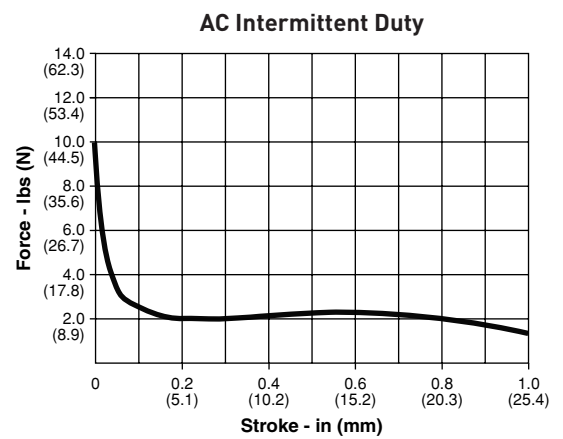
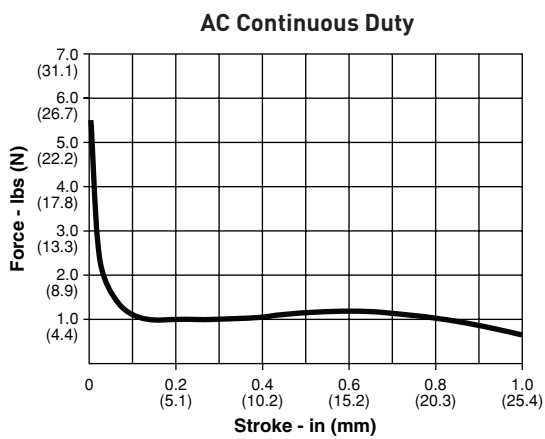
Type	Size	Nominal voltage	Duty	Frame Type	Coil Type	Duty Cycle
C34M-50-M-36	37 x 33 x 42 mm	230 VAC	Intermittent – 62 VA	C Frame	Overmoulded	20% on time

Open Frame C-34M

Dimensions



Performance chart



Open Frame C-34M

Ordering Reference

Type C34M-50-M-36
C34M-520-M-36

Duty Cycle	Continuous – 24 VA	Intermittent – 62 VA
Type	C34-50-M-36	C34-520-M-36
Volts — 50Hz	230	230
Coil Resistance ± 10% (Ohms at 25°C)	524	219

NOTES:

1. All data is typical.
2. Force testing is carried out with the solenoid in the horizontal position.
3. All data reflects operation with no heatsink.
4. Magnetic latching versions available. Pull versions standard; push versions available.
5. Other coil terminations available.

Saia-Burgess Solenoids Selection

Select Solenoids

Example for a Rotary Solenoid

1. Use the charts to determine which coil style and frame size best satisfies your application requirement. Turn to the specification pages listed for Type selection.

2. On the individual specification pages, use the Performance Chart (like the one shown at right), to select one of the five columns which provides the appropriate duty cycle for your application (for example 25%). Reading down this column locate the torque for the stroke you need.

3. Use the type number and configuration chart (like the one at the bottom of this page) to select the type number corresponding to your desired design, stroke, and direction of rotation.

4. Using the Coil Specification Chart (like the one at right), find your selected duty cycle column. Reading down this column provides a variety of specification data. Following further down the column into the VDC ratings, select the voltage which most closely matches your supply voltage (for example, for a 24 VDC supply, select 26.0). Read across to the left to select the coil awg (wire diameter) suffix for this voltage.

5. Replace the last two digits of the type reference (XX) with the coil awg number to complete the type reference. (For this example, specify type reference: H-15039-033).

Performance Specifications

Stroke	Holding Torque ²	Starting Torque (lb-in) @ 20°C				
		Maximum Duty Cycle				
		100%	50%	25%	10%	5%
25°	0.28	*	0.2	0.4	0.8	1.1
35°	*	*	*	*	*	*
45°	0.15	*	0.1	0.2	0.4	0.6

Coil Specifications

Maximum Duty Cycle	100%	50%	25%	10%	5%
Maximum ON Time (sec) when pulsed continuously	∞	100	36	7	2.5
Maximum ON Time (sec) for single pulse	∞	162	44	8	2.8
Watts (@ 20°C)	*	10.5	21	54	108
Ampere Turns (@ 20°C)	*	492	695	1,105	1560

Coil Data

awg (0XX)	Resistance (@20°C)	# Turns	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
25	0.83	140	*	2.9	4.1	6.5	9.2
26	1.38	186	*	3.7	5.2	8.2	11.6
27	1.91	210	*	4.5	6.3	10.1	14.2
28	3.17	273	*	5.7	8.1	12.8	18.1
29	5.17	352	*	7.2	10.2	16.2	23.0
30	8.25	441	*	9.2	13.0	21.0	29.0
31	12.95	550	*	11.6	16.4	26.0	37.0
32	20.71	682	*	14.9	21.0	34.0	47.0
33	30.60	828	*	18.2	26.0	41.0	58.0
34	50.95	1078	*	23.0	33.0	52.0	74.0
35	83.92	1392	*	30.0	42.0	67.0	94.0

Saia-Burgess Technical Information

A solenoid is a basic, rugged device. Its component parts consist of a coil (to carry current and generate ampere turns), an iron shell or case (to provide a magnetic circuit), and a movable plunger or pole (to act as the working element).

A major objective in the design of a solenoid is to provide an iron path capable of transmitting maximum magnetic flux density with a minimum energy input. Another objective is to get the best relationship between the variable ampere turns and the working flux density in the air gap. When applying a solenoid, it is extremely important to consider the effects of heat, since for a constant voltage application, an increase in coil temperature reduces the work output.

Ambient temperature range, voltage fluctuation, return springs and temperature rise all affect the net output torque/force. For preliminary calculations, we recommend that a 1.5 safety factor be applied to the variables.

Magnetic Flux

Magnetic flux lines are transmitted through the iron shell and the air gap between the shell and the plunger (for linear solenoids) or the armature (for rotary solenoids). An iron path is much more efficient than air, but the air gap is needed to permit movement of the plunger or armature. The force or torque of a given solenoid is inversely proportional to the square of the distance between the pole faces. The lowest force or torque is generated when the distance is widest/longest; the strongest when the distance is smallest.

Saturation

Saturation of the iron path in a solenoid can be considered in two ways. In the true sense it is point (a) at which the iron ceases to carry any increase in flux. In broader terms, saturation is usually considered as point (b), where the iron begins to saturate.

As the pole pieces are moved together or when input power is increased, the flux density of the magnetic circuit increases until the iron saturates near point (b). Beyond this point any further increase in power only serves to add heat without an appreciable increase in force or torque. By changing the iron path area, the pole shape, or the magnetic circuit material, output torque/force can be increased.

Ampere Turns

The number of copper wire turns, the magnitude of the current, and permeance of the magnetic circuit determine the absolute value of magnetic flux within the solenoid. The permissible temperature rise limits the magnitude of the power input. When using a constant voltage, heat makes the coil less efficient because it reduces the ampere turns and, hence, the flux density and the torque/force output.

Heat

Heat can be dissipated by controlling the air flow, by mounting the solenoid on a surface large enough to dissipate the energy (heat sink), or by resorting to some other cooling method. When space permits, a simple solution is to use a larger solenoid. Heat in a solenoid is a function of power and the time during which power is applied. For continuous duty, hold-in resistor circuits are commonly used to provide higher starting torques/forces than are obtainable at continuous duty rating.

Our stock type standard solenoids are designed to operate in ambient temperatures of -55°C to 80°C. A solenoid operating at the predetermined conditions established in the coil data charts, with the specified heat sink, will have a coil temperature rise of about 80°C (above ambient temperature). Our standard solenoids will withstand 120°C without thermal damage.

Saia-Burgess Technical Information

A special high temperature coil with a 175°C temperature limit, for operation in up to 95°C ambient, is available for rotary and low profile solenoids.

Duty Cycle

Duty cycle is determined by ON time/(ON + OFF) time. For example, if a solenoid is energised one second out of four seconds, the duty cycle is $1/(1 + 3) = 1/4$ or 25%. Duty cycle is the time factor which determines the permissible watts input and the subsequent amount of torque/force and heat. If, for example, a 10-watt input power causes a heat rise of 20°C in 10 seconds, approximately the same temperature rise will result if a power of 100 watts is applied for one second. In terms of duty cycle, a solenoid designed for continuous duty can dissipate ten times the input power at 10% duty.

Maximum ON Time

Solenoids have a maximum ON time for a given duty cycle, wattage and power input. For example, if a solenoid is energised for one second out of four (25% duty cycle), its ON time is one second, which will cause no damage. On the other hand, if the solenoid is energised for 10 minutes out of every 40 minutes at the 25% duty cycle wattage, the duty cycle is still 25%, but its ON time is now 600 seconds. A single pulse of this duration would burn out the solenoid. DC solenoids are specified with two criteria for maximum ON time: when pulsed repeatedly at the stated watts and duty cycle, and; for a single pulse at the stated watts (with the coil at 20°C ambient temperature).

Operating Speed

The energising time for a solenoid to complete a given stroke is measured from the beginning of the initial pulse to the seated or energised position. For a given solenoid, this time is dependent upon the load, duty cycle, input power, stroke and temperature range. When

a DC voltage is impressed across the solenoid coil, the current will rise to point (a) as shown on the graph below.

This time delay, which occurs prior to the plunger motion, is a function of the inductance and resistance of the coil, and the flux required to move the armature against the load. An increase in the magnetomotive force is created by closing the air gap (change in inductance) as the plunger moves through the stroke, causing a dip in the current trace. The cusp at point (b) indicates that the solenoid has completed the stroke. The current trace then begins to rise to a steady state current value which, by Ohm's law, is $I = E/R$.

The current trace of a solenoid can be observed on an oscilloscope by monitoring the voltage drop across a low resistance, high wattage resistor in series with the solenoid coil.

At point (a) the solenoid has developed sufficient flux to move the load. As the load increases, more time is required to reach point (c), as shown by the phantom current trace. If the load is greater than the output of the solenoid, then the coil will build to a steady state value and a dip in the trace will not occur since the plunger has not moved (top curve).

More time is required to complete the stroke within the force limits of the solenoid as the load increases, the power decreases, or the ambient temperature increases, since these factors affect the net force of the solenoid.

When selecting a solenoid for an application, it is important that these variables be taken into consideration to determine the maximum length of the ON pulse. Once the nominal energising time has been established, sufficient ON time beyond point (b) should be allotted to compensate for the change in speed due to the maximum load, minimum voltage, and maximum coil temperature.

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The length of the OFF time or interval between pulses is established by the duty cycle and the input power. If a pulse train is applied for an indefinite period, the interval between pulses should be sufficient to maintain the duty cycle for the input power and wire size tabulated in the coil data tables. Response to a faster pulse rate for intermittent operation is then limited by the temperature rating of the coil and the return speed of the plunger. The return speed can be established by reducing the OFF period until the solenoid energising trace becomes erratic.

When designing for high speed pulse trains, it is important to consider the type of coil suppression used, and the location of the control circuit. A diode across the coil may provide satisfactory coil suppression, but it causes a slower collapse of the magnetic field, lengthening the OFF interval required. Ledex high speed coil suppressors use a diode/capacitor/zener diode principle to decrease the drop-out time as well as effectively suppress transients. Placing the control switch to the solenoid on the AC side of a rectifier will have an effect similar to that of using a diode across the coil. If de-energising speed is critical, the control switch should be located on the DC side of the rectifier and a high speed coil suppressor should be used to provide adequate suppression while allowing fast plunger return speed.

Continuous Duty

For continuous duty applications, or where there is a chance that an operator might close the control switch for a long period, the project engineer has several choices. He can specify a solenoid large enough to provide the torque/force needed on a continuous basis or, if the application permits a higher coil temperature rise, he can specify a smaller solenoid with a high temperature coil to obtain

continuous duty operation at a higher power level. He can also use a smaller solenoid and take advantage of the higher torque/force obtainable with an intermittent duty cycle input power. This can be accomplished by using a hold-in circuit to reduce current to a point where torque/force is sufficient to maintain the solenoid in the energised position.

Mechanical Hold-In Resistor Circuit

One of the more common methods to reduce coil current is a normally closed (NC) switch in parallel with a hold-in resistor. When push button (PB) closes the circuit, full voltage is impressed across the solenoid coil, bypassing the resistor through the NC switch. As the solenoid approaches the end of its stroke, a mechanical connection opens the NC contacts, inserting the resistor in series with the coil. This reduces the solenoid voltage to a point where the power input is high enough to allow the solenoid to hold in, and yet stay within its normal heat dissipating range.

Capacitor Hold-In Resistor Circuit

In some cases, a switchless hold-in circuit may be used on 115 VAC applications. This consists of a capacitor which charges to a peak of approximately 150 volts. A resistor in the line ahead of the rectifier controls the hold-in current after the discharged capacitor has supplied the initial high stored energy.

Transistorized Hold-In Circuit

As shown in the transistorised circuit on page H2, when the NO switch is closed, current flows through the base-collector while the capacitor is charging to input voltage. As the base-collector current flows, the emitter-collector circuit allows full power to be impressed across the solenoid coil. The transistor is switched off when the capacitor reaches full charge. Current flow is then through the hold-in resistor and

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solenoid coil at continuous duty power or less. When using this circuit, it is important that the transistor be on long enough to allow the solenoid to move the load through the complete stroke.

The graph on page H2 is a convenient guide to estimate hold-in resistor values. Because the actual value can vary according to the size of the load to be held, it should be used only as a starting point. Keep in mind that more hold-in current (lower resistance) is needed as the hold-in load increases. To use the graph, locate the coil resistance on the horizontal scale, then read the approximate hold-in resistor value on the vertical scale.

Temperature and Force/Torque Resistance

The force/torque curves and coil data in this catalog are based on the coil being at an ambient temperature of 20°C, and the use of a heat sink comparable to that called out in the notes below each table. When a solenoid is energised, the coil temperature rises. Since resistance varies with temperature, an increase in temperature produces a proportional increase in resistance. Increased resistance reduces the current flow when constant voltage is applied, and decreases the effective ampere turns and torque/force output. For each degree above or below 20°C, the resistance of the coil's copper wire changes by 0.393 percent per degree. A coil temperature rise of 80°C, for example, will increase the coil resistance by a factor of 0.314, which is equal to 80°C x 0.00393/°C. Calculation of resistance at any other temperature (t2) can be made using the following formula:

$$R_{t2} = R_{20^{\circ}C} [1 + 0.00393 (t2-20)]$$

Rearrangement of the formula produces a ratio between R20°C and Rt2 as follows:

$$R_{t2}/R_{20^{\circ}C} = 1 + .00393 (t2 - 20) = \text{Resistance Factor (R.F.)}$$

The Resistance Factor of copper wire at temperatures from -60°C (-76°F) to 260°C (500°F) is graphed below.

Once the actual coil temperature (ambient plus rise) is determined, the resistance factor can be determined as follows:

A size 3E, 31 awg (wire diameter) coil has a resistance of 31.8 ohms at 20°C. After operating for a prolonged period at 10% duty, the approximate coil rise is 80°C. Added to 20°C, the coil temperature is 100°C. The Resistance Factor graph indicates a 1.5 factor (point where 100°C and diagonal intersect). At 100°C, the resistance of the 31.8 ohm coil is increased by this factor. With a constant voltage applied, the power decrease is proportional to the resistance increase (P =E2/R). The 10% duty power of a size 3 solenoid is 90 watts (at 20°C). The decrease in power at the increased temperature is calculated by:

$$\frac{90 \text{ (Power at } 20^{\circ}\text{C)}}{1.5 \text{ (Resistance Factor)}} = 60 \text{ W}$$

By interpolating between the 25% and 10% duty cycle curves, the reduction in force due to the 80°C rise can be estimated for a given stroke.

How to Simulate a Coil Wire Size

If you have a stock type solenoid, you can simulate performance with a different wire gauge by changing the input voltage. A rule of thumb is that, as each wire size changes from one gauge to the next, the voltage increases or decreases by the cube root of 2, or a factor of 1.26.

Coil data charts in this catalog are tabulated with voltage values which provide essentially constant ampere turns for each wire size at given duty cycles. A stock type solenoid with

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a given coil awg (wire diameter) can be used to simulate other wire gauges under different voltage conditions as follows:

Assume you have a 12-volt power supply and you want to experiment with a size 3 low profile solenoid at continuous duty. In the size 3 coil chart, the closest continuous duty coil is 30 awg (wire diameter) (15 volts). You can simulate the exact conditions you would have with a 30 awg (wire diameter) coil and a 12 volt input by using a stock type with (1) a 28 awg (wire diameter) coil, or (2) a 33 awg (wire diameter) coil.

(1) The size 3, 28 awg (wire diameter) coil is rated at 8.4 volts, continuous duty. The desired 30 awg (wire diameter) coil is 2 gauges higher.

$$\frac{12 \text{ (your voltage)}}{1.26^2} = 7.5$$

(factor for two awg (wire diameter). changes)

7.5 = voltage to simulate 30 awg (wire diameter) coil at 12 volts when using stock type size 3 with 28 awg (wire diameter) coil.

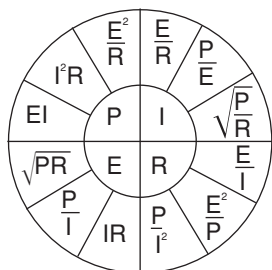
(2) The 33 awg (wire diameter) is rated at 26 volts, continuous duty. The desired 30 awg (wire diameter) is three gauges lower.

$$12 \text{ volts} \times 1.263 = 24$$

24 = voltage to simulate 30 awg (wire diameter) coil at 12 volts when using stock type size 3 with 33 awg (wire diameter) coil.

Input Power and Ohm's Law for Direct Current

To understand the relationships of power, current, voltage and resistance, use the chart below.



- P = Power (watts)
- I = Current (amperes)
- E = Electromotive force (volts)
- R = Resistance (ohms)

Estimating Temperature Rise

Two constants are specific to a system or device to determine temperature rise: thermal resistance and thermal time constant. Knowing that solenoids, with their associated heat sinks, are designed for an 80°C rise over ambient, thermal resistance may be calculated by dividing the continuous duty wattage into 80 and adjusting for temperature. For example, a size 5 solenoid has a continuous duty wattage of 21 watts. Adjusting for a 80°C rise by the resistance factor of 1.314 gives:

$$\frac{80}{\left[\frac{21}{1.314} \right]} = \text{thermal resistance}$$

$$= 5.00^\circ\text{C/watt}$$

The thermal time constant can be estimated by looking at the maximum allowable single pulse. Before the thermal resistance can be solved for, it must be remembered that the resistance changes due to temperature. The resistance factor is

$$1 + (80 \times 0.00393) = 1.314$$

This changes the power at high temperature. To find the thermal resistance, simply divide the temperature rise by the actual power.

$$K = \frac{80}{\left[\frac{P}{1.314} \right]}$$

Where P = the continuous duty power in watts @ 20°C.

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For example, a size 5 solenoid again has a continuous duty rating of 21 watts. Hence, the thermal resistance is 5.00°C/watt.

To find the thermal time constant, an analogy to a charging capacitor must be made. The heating equation can be related to the charging time such that:

$$T_h = \frac{20 + P * K * (1 - e^{-t})}{1 + 0.00393 * TR}$$

where:

T_h = Temperature (°C) at end of ON cycle

P = Power in watts at 20°C

TR = Temperature Rise (°C)

K = Thermal resistance (°C/watt)

t = time (seconds)

t = thermal time constant (seconds)

Because the time constant is dependent on duty cycle, due to the time required for heat to transfer from the inside to the outside, it has been found that the power ratio of input to continuous raised to the 0.6 power makes a reasonable estimate. Hence, the equation is best used in the following form:

$$T_h = \frac{20 + P * K * (1 - e^{-t * D^{0.6}})}{1 + 0.00393 * TR}$$

where:

D = ratio of input power to continuous duty power.

Solving for t,

$$t = \frac{-Pulse * D^{0.6}}{\ln(1 - \frac{1}{D})}$$

where pulse = the maximum single ON pulse in seconds for a particular duty cycle.

Using the same size 5 solenoid which has a 50% duty cycle power of 42 watts and

a maximum single pulse of 160 seconds yields a thermal time constant of 350 seconds.

For repetitive cycles, the general cooling curve determines the initial starting temperature for the next power cycle. This equation is:

$$T_c = (T_h - 20) * (e^{-t * D^{0.6}}) + 20$$

where T_c = temperature (°C) at end of OFF cycle.

After this temperature is determined, the power and resistance must be recalculated for an accurate starting power. Also, the time must be calculated which, if starting at ambient, would have given that heat rise. The equation is:

$$t = \frac{-t}{D^{0.6} * \ln(1 - \frac{T_c - 20}{T_h - 20})}$$

A size 5 solenoid is rated for having a maximum ON time of 100 seconds for a 50% duty cycle, which means that the OFF time must be a minimum of 100 seconds also. Using the preceding values shows the temperature to vary as follows:

Cycle	Equivalent Time		
	ON	OFF	(Sec.)
1	79.8°C	58.8°C	55
2	98.5°C	70.9°C	79
3	105.0°C	75.1°C	88
4	107.5°C	76.6°C	92
5	108.1°C	77.1°C	93
6	108.4°C	77.3°C	94
7	108.5°C	77.4°C	94
8	108.6°C	77.4°C	94

As can be seen here, the maximum is slightly exceeding the rated value of 105° C.

This value is fine for a starting point, but may not be representative of the actual usage of the solenoid. For this case, the thermal resistance

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and thermal time constants of the actual system may be determined experimentally. An easy way is to put a known wattage on the system and plot resistance vs. time. By knowing the total temperature rise, the thermal resistance is calculated by temperature rise divided by known input wattage. The thermal time constant is determined by finding the time to reach 67% of the total rise.

Once these values are determined, the maximum temperature can be estimated for any ambient, power and duty cycle.

Environmental Considerations

Factors which impact the operation and performance of solenoids include:

- Temperature
- Sand and dust
- Humidity
- Shock and vibration
- Altitude, vacuum and pressure
- Specific application considerations such as paper dust and exposure to certain chemicals

Please consult Saia-Burgess, if any of these factors are prominent in your planned solenoid design.

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Air Cap

The air space between the armature hub and the base or the air space between the stationary and the moveable pole piece.

Ampere Turns

The absolute value of magnetic flux determined by the number of copper wire turns in the coil and the magnitude of the current.

Permissible temperature rise of the coil limits the magnitude of the power input. Heat makes the coil less efficient because it reduces the ampere turns and hence the flux density and the torque or force output

Anchor Plate

The thin formed sheet metal plate fitted over the mounting studs on the base of rotary solenoids to provide containment for the return spring. It has tabs formed up around the circumference which are used to attach the end of the spring and allow adjustment.

Armature Assembly

The assembly consisting of the armature plate, the hub, and the shaft which is the complete moving element in a rotary solenoid.

Armature Plate

The large diameter plate which forms the main rotating element of the solenoid and contains the ball races which convert linear to rotary motion. Made from SAE #1008 or 1010 CRS and case hardened for wearability in the ball races.

Axial Stroke

The amount of longitudinal movement the armature assembly travels as it rotates through its stroke. Value range from 0.6 mm to 2.5 mm depending on solenoid size and length of stroke.

B-H Curve

The graph of the ratio of flux density to magnetic field intensity. The magnetic field intensity is usually plotted logarithmically.

Ball Bearings

Precision stainless steel Ball bearings are used in rotary solenoid ball races to provide essentially friction free rotary movement between the armature plate and the case.

Bobbins

Most bobbins are made of nylon 6/6 and meet UL file #E-41938 or E-39806B.

Bobbin Wound Coil

A coil, usually random wound on a spool which maintains the form and shape of the coil and also provides the coil insulation.

Case

The outer shell and main component of the solenoid coil housing. Made of CRS #1008, #1010, 12L14 or 1215 case hardened to 513 on the Vickers scale (RC50) for sizes 0 to 6 (sizes 7 and 8 are not case hardened). The case has the three coined ball races, and is formed from flat stock drawn into a cup (size 7 is machined from bar stock and size 8 is made from tubing stock because of their size and thickness).

Coil

Copper windings providing the electrical element of the solenoid through which current is passed to generate a magnetic field. Coils may be precision wound which allows the maximum amount of copper in the space provided or random wound or bobbin wound.

Coil Arc Suppression

The application of electronic protection devices across switch contacts and coils to reduce the arc caused by interrupting the current flow through an inductive device such as a solenoid. Appropriate coil suppression greatly reduces this arcing.

Coil Resistance

Coil resistance is the property of the coil which impedes the flow of current through it when a voltage is applied. Resistance values are shown in ohms for each solenoid wire awg (wire diameter) for a temperature of 20°C. A resistance conversion factor may be used to determine what the resistance would be at other temperatures. This is particularly helpful in determining the effects of temperature on output torque or force. Use the resistance factor chart on page 18 or refer to the Temperature and Force/Torque Resistance section on page 13 for further calculation of resistance at temperatures other than 20°C.

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Coining

The process of striking the armature plate or case to form the three ball races on rotary solenoids. This process provides an extremely smooth, mirror-like surface in the ball races.

Dielectric

Dielectric is the resistance between the coil and the case. Minimum dielectric value is 500 VRMS and range up to 1,500 VRMS depending on the solenoid size type and wire gauge. Dielectric values are shown for each solenoid in the specifications chart.

Dust Cover

A protective sheet metal cover pressed over the armature plate end of the rotary solenoid to protect the armature and bearing balls from dirt and other contaminants.

Duty Cycle

ON Time/ON+OFF Time = Duty Cycle. Standard duty cycles used in this catalogue are 100%, 50%, 25%, 10% and 5%. Other values can be determined by interpolation between any two columns.

Elongated Coils

These coils are 16% longer than standard precision wound rotary solenoid coils, and provide 50% more copper. These units will provide approximately the same torque with less wattage. If the same wattage as the standard precision coils is used, they will provide slightly more torque.

Ending Torque

Torque that a rotary solenoid develops in the last degree or two of stroke.

End Play

The amount of free axial movement built into a rotary solenoid in the completely de-energised position. This axial movement, normally only a few thousandths of an metric, assures that the solenoid is capable of returning to the completely de-energised position and does not stop before the balls reach the end of their races.

Flux Density

The number of Webers per square meter in a cross section normal to the direction of the flux.

This quantity is known as Tesla and given the symbol B. The typical knee in the B-H curve where iron becomes difficult to further magnetize is around 1.6 Tesla.

Flux, Magnetic

The physical manifestation of a condition existing in a medium or material subjected to a magnetising influence. The quantity is characterised by the fact that an electromotive force is induced in a conductor surrounding the flux during any time there is a change in flux magnitude. A unit of flux is a Weber which is defined as that which being linearly attenuated to zero in 1 second, induces in a surrounding turn, an EMF of 1 volt.

Gross Torque

The starting torque available from a rotary solenoid before subtracting the nominal return spring torque.

Heat Rise

The rise in temperature which results from operating the solenoid at the predetermined conditions established in the coil data charts, with the specified heat sink. Standard solenoids will have a temperature rise of 80°C over ambient.

Heat Sink

The maximum allowable watts for each solenoid are based on an unrestricted flow of air at 20°C with the solenoid mounted on the equivalent heat sink specified for each size. Inadequate heat sink or restricted air flow may result in overheating of the solenoid.

Holding Torque

The torque required to break the armature loose from the energised position while under power. Normally checked under continuous duty operation and after reaching the stabilised operating temperature.

Hub

Part of the armature plate assembly which forms the moving pole face. Made of 12L14 or 1215 CRS. The shaft is pressed into the hub which is staked to the armature plate.

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Lead Wires

Standard temperature rated coils use PVC insulated stranded lead wire, UL style 1007 rated for 80°C at 300 volts. It also meets CSA type TR-64, 90°C at 600 volts; and MIL-W-16878/2, 105°C at 1000 volts. High temperature coils use Teflon Type E, TFE, and meets MIL-W-16878/4A rated at 200°C at 600 volts.

Lubricant

Standard rotary solenoids are lubricated in the ball races and in the sleeve bearing with Nye Rheolube #719L, a lithium soap-based synthetic hydrocarbon grease with wide temperature capabilities from -54°C to over 93°C. The base oil is compatible with most ester-vulnerable plastics and elastomers. It contains a rust inhibitor and an ultraviolet sensitive dye. Endurance engineered solenoids are lubricated with Shell Alvania #2 which is also a lithium soap-based grease with a temperature range of -29°C to 121°C.

Magnet Wire

100% copper wire, UL-recognized, single film insulation rated at 200°C (Class H), meets UL file E-37683 or E-34609. Also meets Federal specification J-W-1177/13 or J-W-1177/14. Tubular and Open Frame solenoids use single-build insulation rated at 130°C. It is UL File E-34609 or E-37683 and meets Federal specification J-W-1177/9.

Magnetic Field Intensity

The closed loop integral of this quantity is equal to the total current enclosed, as defined by Maxwell's equation. Or, the magnetomotive force per unit length in a magnetic circuit. This quantity is given the symbol H.

Magnetomotive Force

See ampere turns.

Needle Bearing

A bearing used in long life rotary solenoids which is a circle of long needles forming the bearing surface for the shaft.

Net Torque

The starting torque available from the solenoid after subtracting the nominal return spring torque.

PWM

(Pulse Width Modulation)

If a solenoid is controlled by a transistor which is signaled from a microprocessor, the PWM can be considered as an alternate means for reducing size or saving energy. PWM reduces the effective voltage by pulsing the voltage input. For example, if a solenoid has 12 volts supplied, but at 500 Hz at a 50% duty, the solenoid acts exactly as if it is connected to a 6-volt supply. If the duty cycle is changed to 25%, then the solenoid performs like one hooked to a 3-volt supply. The frequency must be higher than the solenoid can respond to otherwise chatter or humming will occur. Due to the inductive nature of the solenoid coil, the current is smoothed resulting in a constant force. Initially, the microprocessor must leave the transistor on long enough to allow the solenoid to energise. After that point, the micro-processor must alternately issue ON and OFF pulses to the transistor to achieve the appropriate duty cycle.

Permeability

The ratio of flux density in a given medium to the magnetic field intensity. The symbol used is μ and has the value of $4\pi E-7$ in a vacuum.

Permeance

The ratio of the flux through any given cross section of a given medium (bounded by equipotential surfaces) to the difference in magnetomotive force between the two surfaces.

Plunger

The magnetic moving component of a linear solenoid, typically made from cold, rolled steel.

Precision Wound Coil

A coil whose individual turns have a prescribed pattern which they must follow during the winding process whereby each turn is laid precisely next to the previous turn. This process allows for the maximum amount of copper in the allotted space. Normally carries a $\pm 5\%$ tolerance on coil resistance.

Random Wound Coil

A coil whose turns are allowed to wind randomly in no specific pattern. One turn may overlap another or may lay side by side or even spiral completely across the surface of the

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coil. Normally carries a $\pm 10\%$ tolerance on resistance

Relative Permeability

The ratio of the flux density in a given medium to that which would be produced in a vacuum with the same magnetising force. Non-magnetic materials, including air, have a relative permeability of 1, while magnetic materials such as iron, have initial relative permeabilities of around 2,000.

Residual Magnetism

The magnetism which remains in effect on a piece of magnetic material or between two pieces of magnetic material after the electromagnetic field created by the coil has been removed. An air gap is usually maintained between two magnetic poles to minimise the effects of residual magnetism.

Resistance Tolerance

Coil resistance tolerances are generally $\pm 5\%$ for heavier gauge wires where precision coil windings are used and $\pm 10\%$ for finer gauge wire where random winding processes are used. Tolerances are shown for each solenoid in the individual specification charts.

Return Springs

All standard stock rotary solenoids have scroll type return springs. Values range from 1 gr in to 1 N in depending on the solenoid size. Tolerance on springs are $\pm 20\%$ of the nominal value shown. Return springs are an available feature on any solenoid.

Safety Factor

The ambient temperature range, voltage fluctuation, return springs and temperature rise all affect the net available output torque or force of a solenoid. A 1.5 safety factor should be applied to preliminary calculations of torque or force.

Shaft—Other Solenoids

The main shaft of the solenoid which runs from the armature through the base and out the bottom and provides the main bearing. The shaft is also used for external attachment to the solenoid. Normally made of non-magnetic #303 stainless steel. On long-life rotary solenoid types the shaft is made of CRS #12L14 or

1215 which has been case hardened in the bearing area for wear resistance.

Shaft—Tubular Solenoid

The small diameter portion of the plunger assembly of a push-type tubular solenoid which protrudes through the base or stationary pole face and provides push capability; usually made from #303 stainless steel.

Sleeve Bearing

The cylindrical bearing in the base of the solenoid which provides a guide for the shaft. Usually made from phosphor bronze, it can be made of other materials for different applications requiring longer life.

Sleeving

Sleeving used on standard solenoids to insulate the lead wires where they exit the solenoid case is black Vinylite per Mil-I-631B, Type F, subform Ua, Grade C, Class 1, Category 1, and meets UL file #E13565 and E-18459. Sleeving on high temperature coils is Teflon for temperatures up to 200°C continuous and will meet the requirements of AMS 3655 and UL file #E-20344 and E-39513.

Starting Torque

The torque which is produced by a rotary solenoid in the first degree or two of stroke from the de-energised position.

Stator Assembly

That portion of any solenoid which contains the coil, case and base. This portion remains stationary during operation.

Tape

Coil wrapping tape is clear Mylar brand polyester film 0.002 metric thick which has been slit to the desired width and is used to wrap the coil in an overlapping manner. The film is per Mil-I-631 Type G, Form T_p, Class I, rated for 130°C continuous and meets UL file #E-39505. Coil banding tape is Mylar polyester film, adhesive backed per Mil-I-15126 Type MFT. This tape is used to wrap around the O.D. of the coil one thickness of 0.0025 mm.