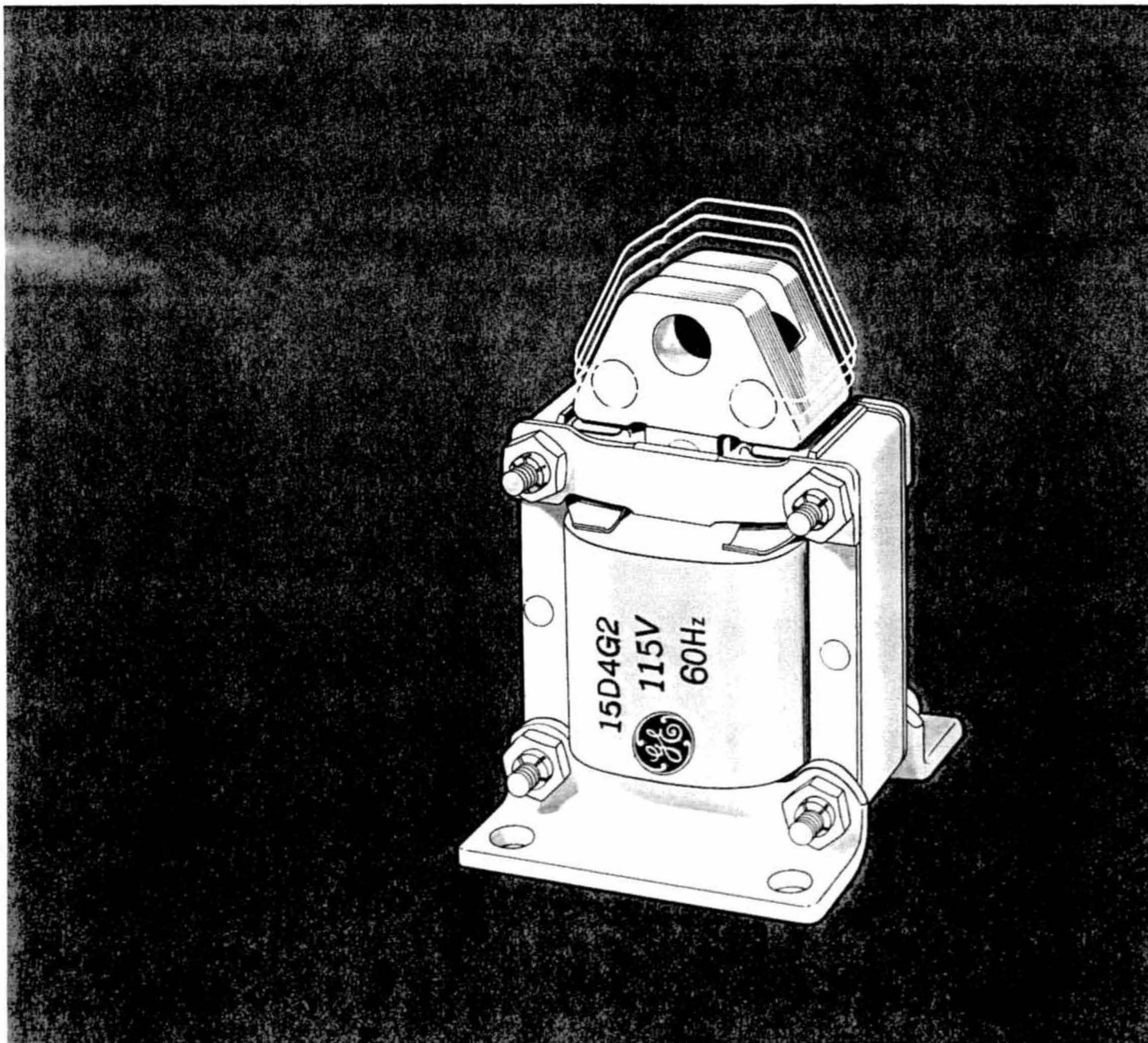
GEA-6215E

control

00221

industrial strongbox solenoids



GENERAL ELECTRIC

IMPROVED GENERAL ELECTRIC SOLENOIDS MEET EVERY APPLICATION NEED

DEPENDABLE OPERATION IN ALL APPLICATIONS

A solenoid is used to convert electrical energy into straight-line, mechanical energy. The exerted force is usually a push or pull action.

A solenoid consists of a frame, plunger, and coil. When the coil is energized, a magnetic field is set up in the frame. This magnetic field causes the plunger to move into the frame. The result is a straight-line force.

In industrial applications, solenoids are used for a variety of purposes including:

1. Hydraulic and pneumatic systems where the solenoid opens and/or closes a valve.
2. Tool lifting for return strokes; to initiate a machining operation.
3. Cutting and shearing operations in which the solenoid operates knife blades.
4. Spring set magnetic brakes where, through a lever system, the solenoid releases the brake on application of power.
5. Safety devices where the energized solenoid holds a latch or locking pin in the open position (in case of power failure, the latch is released and moves into the locked position).
6. Contactors, where the solenoid is used to actuate the contacts.
7. Clamping devices for assembly and machine work.
8. Lever mechanisms to engage or disengage a clutch.
9. Latches for window and door openers.
10. Magnetic brakes where the solenoid exerts force on the brake shoes.
11. Variable reactors for control of small motors and amplifier circuits.
12. Hopper gate actuators for automatic and remote control.
13. Paper, plastic, and thin metal punches where the solenoid drives the punch.
14. Magnetic drivers for small pins and nails.

GENERAL ELECTRIC'S VERSATILE CR9500 SOLENOID

The improved General Electric CR9500 Solenoid has been designed to meet your needs for a solenoid with greater versatility and longer electrical and mechanical life. These are the Measurable Advantages you get with GE solenoids:

Complete Rating Coverage

Nine sizes provide 24 basic ratings for more accurate selection in push or pull, 24 to 600 volts, 25 to 60 Hertz and d-c.

Smaller Size

This improved solenoid is smaller than competitive models in the same ratings to help reduce your space problems and material costs.

Flexibility

You can mount this unit any of six different ways, depending on application. Both terminal and lead-type connections are incorporated in one unit for easy installation.

Long Life

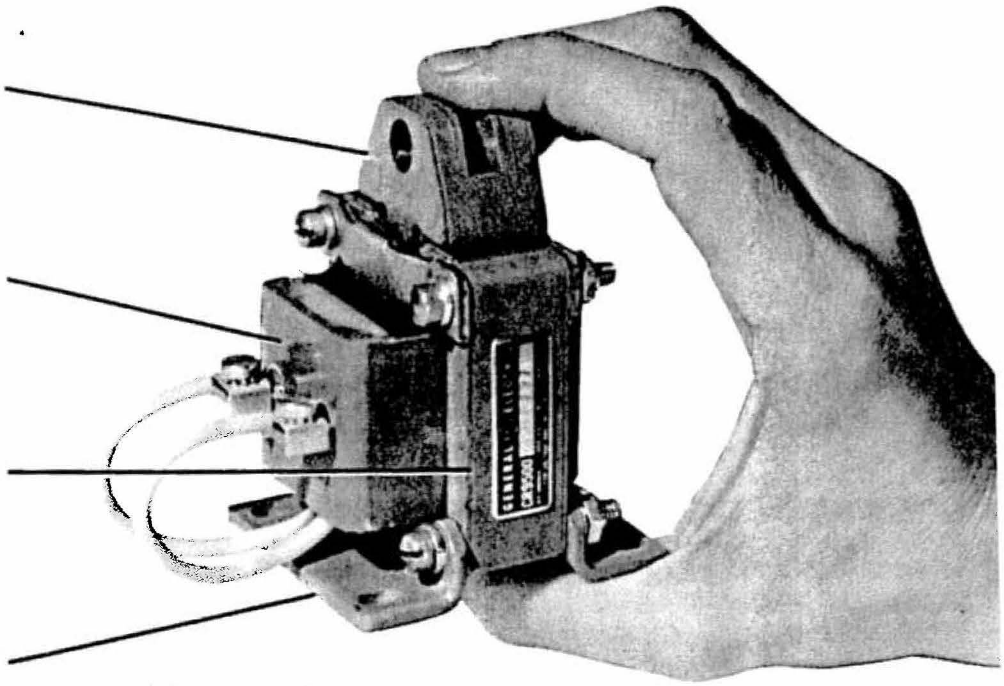
Coil design helps increase solenoid life.

PLUNGER, unit's working arm, moves into frame when solenoid is energized. It returns to normal position, usually by external spring force when de-energized.

COIL carries electric current when the solenoid is energized. A magnetic field, induced by this current, is set up in the solenoid frame to activate the plunger.

FRAME of laminated steel is magnetized by current passing through coil. Magnetized frame attracts the laminated steel plunger, causing it to move into the frame.

MOUNTING transfers impact forces of solenoid plunger to mounting structure. Bracket withstands shock of repeated operation without material failure.



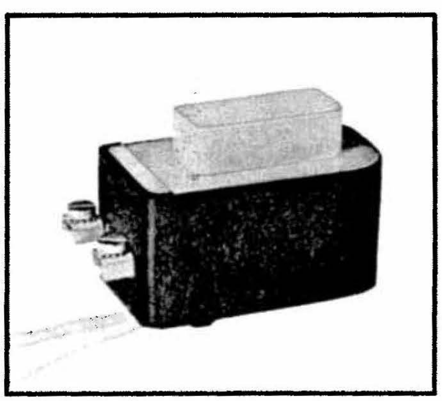
GENERAL ELECTRIC CR9500 SOLENOIDS FEATURE LONG LIFE, COMPACT DESIGN

Thousands of applications have proved the long life of the sturdy General Electric CR9500 solenoids. Now the General Electric solenoid line has been further improved with a strongbox coil featuring complete encapsulation.

STRONGBOX COIL

The coil design provides longer plunger guide life, improved appearance, easier wiring, and improved moisture resistance.

A one-piece zytel* plunger guide and spool body help improve the mechanical life of the solenoid because of the low friction and excellent wearing properties of zytel.



Mechanical life of solenoid is improved through coil design utilizing one-piece zytel plunger guide and spool body. Greater moisture resistance results from encapsulating windings in glass-reinforced alkyd.

*Registered Trade Mark of the DuPont Co.

The triple varnish-coated wire is wound on the spool body by high-speed, semi-automatic equipment to give a more uniform coil structure for more consistent performance.

The windings are encapsulated with a glass-reinforced alkyd under heat and pressure to produce a more moisture-resistant coil. The encapsulation also provides greater resistance to abuse caused by a slipping screwdriver or wrench. The large clamp-type coil terminals are securely anchored in the encapsulating material.

The coil is similar in construction to the strongbox coil in General Electric 100-Line magnetic starters — starters which have proved their long, reliable performance in thousands of applications. The solenoid coil, with $\frac{3}{64}$-inch lead insulation, is clearly identified by catalog number, voltage, frequency and the General Electric monogram to meet JIC requirements.

LAMINATIONS AND PLUNGER

Contributing to the long mechanical life of General Electric CR9500 solenoids is the construction of the frame and plunger. The silicon-steel laminations are held together with large rivets. Hydraulic riveting causes the rivet to expand evenly giving metal-to-metal contact throughout the length of the rivet. This riveting process reduces vibration or separation of the laminations after repeated use.

The large plunger linkage-pin hole gives assurance against broken linkage pins, and elongated linkage-pin holes. Linkage-pin holes are designed to accommodate standard stock diameter material. Non-magnetic, stainless steel, coil-retainer strips, bolted to the laminations, reduce side pull on the solenoid.

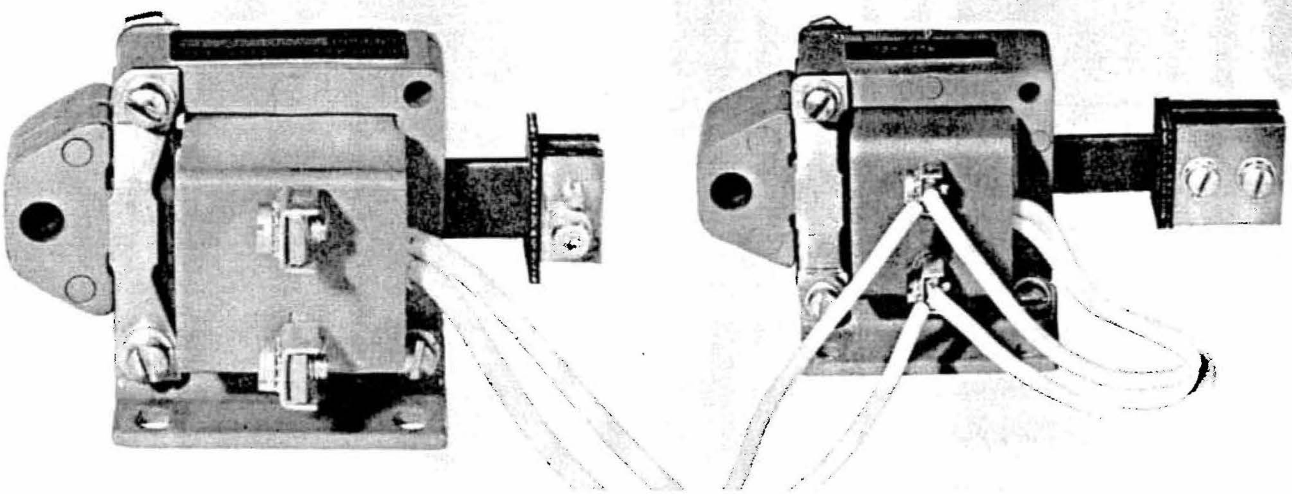
SPRING STEEL MOUNTING BRACKETS

Double strength, spring-steel mounting brackets are used because their resiliency reduces the strain on other components. Bracket design gives additional strength around the mounting holes for longer mechanical life.

The spring-steel brackets help to absorb much of the shock of plunger impact. Many tests on this improved line of industrial solenoids plus years of field experience enabled GE to select bracket size and mounting hole positions which give longer mechanical life.

PUSH FORM

Life of the push form is equal to that of the pull form. In the push form, the push bar is an integral part of the plunger. Two hardened-steel striking pads on the push bar distribute the load, and a cord-reinforced neoprene bumper helps absorb the shock of spring return.



The General Electric CR9500 solenoid gives you a choice of lead-type connection (left) or terminal-type connection (right). You get this flexibility without having to specify it.

GENERAL ELECTRIC'S PROVED APPLICATION FLEXIBILITY

The General Electric CR9500 strongbox solenoid provides design improvements that allow more freedom in [illegible] design and application.

CHOICE OF CONNECTIONS

The strongbox coil of the industrial solenoid has been designed so you can choose either a lead or clamp-type-terminal connection without specifying it. You have both methods wrapped up in one package for more flexible wiring.

For a lead-type connection, make the conventional spliced connection between the two coil leads and incoming power lines. If you prefer the terminal type connection, insert coil leads into the built-in terminal board at the same time you insert the incoming power lines. Then, tighten the terminal screws and the solenoid is connected. These terminals serve only as junctions, and are not connected to the coil windings. The strongbox coil can be reversed so that the coil leads are always accessible and the solenoid nameplate visible when mounted on special applications.

SIX-WAY MOUNTING

The six-way mounting allows you to use the best mounting method for your application. Mounting brackets are fastened to the frame with two screws for conventional end mounting, right- or left-hand side mounting, throat mounting, or both side mounting. The mounting feet may also be removed and the solenoid mounted on equipment with thru-bolts.

PUSH AND PULL FORMS

You have your choice of a GE strongbox solenoid in either the push or pull form. Both forms are available in a complete range of voltage ratings, a-c and d-c.

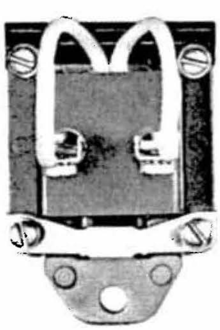
COMPLETE RATING COVERAGE

Complete rating coverage gives you the opportunity to select from a wide range of forms and sizes with minimum cost. The General Electric strongbox solenoid has three lamination sizes and three stacking widths, making nine basic frame sizes. These nine sizes have been designed to provide 24 ratings, which give a complete, even distribution.

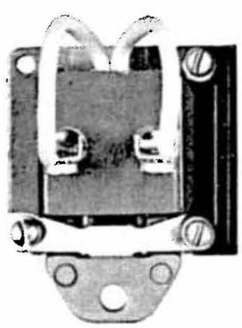
This distribution is available in both push and pull, d-c and a-c, 25 to 60 Hertz, 24- to 600-volt forms. Nominal rating at maximum stroke, 60 Hertz are:

½ inch pull — from 2.7 to 31 lbs.
1 inch pull — from 1.0 to 27 lbs.
½ inch push — from 1.8 to 24 lbs.
1 inch push — from 3.0 to 19 lbs.

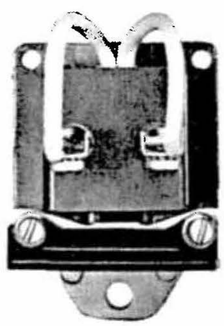
YOU HAVE A CHOICE OF SIX MOUNTING METHODS



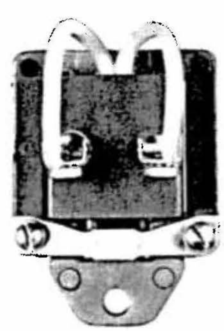
(A) End Mounting



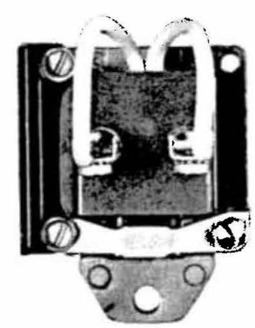
(B) Right Side Mounting



(C) Throat Mounting



(D) Thru-bolt Mounting



(E) Left Side Mounting

The line of General Electric CR9500 strongbox solenoids can be mounted six ways: (A) conventional end mounting where the mounting brackets are assembled on the solenoid frame at the end opposite the plunger head; (B) right side mounting; (C) throat mounting; (D) thru-bolt mounting on a suitable bedplate or bracket on your equipment; (E) left side mounting; and (F) both side mounting (not shown). The parenthesized letters indicate the type of mounting as explained in paragraph #8 of "Ordering Information," on page 5.

HOW TO SELECT THE RIGHT SOLENOID

To get the best results from your solenoid application, check the loading conditions and select the solenoid that will give optimum performance. As a guide, the following six rules of good solenoid application practice should be followed:

1 Obtain Complete Data on Load Requirements

Both the ultimate life of the solenoid and the life of its linkage depend upon the loading of the solenoid. If the solenoid is underloaded, life is decreased because of excessive pounding. If overloaded, the solenoid may not seat correctly with resultant coil noise, overheating and eventual burn out. Therefore, an accurate tabulation of the required force at specific working strokes (pounds load vs inches travel) should be made.

2 Allow for Possible Low Voltage Condition of Power Supply, Select Solenoid on Basis of "Recommended Load"

Since the pull of a solenoid varies as the square of the voltage, some allowance must be made for low-voltage conditions of [illegible] supply. It is recommended that the [illegible] be applied in accordance with "Recommended Load". This rating is based on the amount of force the solenoid can develop with 85% of rated voltage applied to the coil.

3 Use Shortest Possible Stroke

Length of stroke is very important to the realization of ultimate solenoid performance.

First — Shorter strokes mean faster operating rates. Shorter strokes require less power with a subsequent decrease in coil heating. Any decrease in the heating will increase available operations per minute.

Second — More force is available at shorter strokes. This allows a smaller, lower rated, lower cost solenoid to be used.

Third — Less destructive energy is usually available from shorter strokes. This decrease in destructive energy or impact force will help to increase solenoid life.

4 Match the Solenoid to the Load Data

Force Method — Solenoid ratings and load requirements are usually based on dead-weight forces at specific strokes, and are expressed as pounds at a given linear distance. Many solenoid applications are made by comparing the force required by the load (load curve) and the force available from the solenoid (force curve).

The solenoid will operate a device if the required load (load curve) is consistently less than the available solenoid force (force curve).

Energy Method — By comparing the solenoid energy (inch-pounds) to the load energy (work-inch-pounds) it can be more accurately determined if the solenoid can handle the load.

In making this comparison two specific conditions for satisfactory operations must be met; one, the load energy must always be less than the total solenoid energy throughout the working stroke; and, two, the force produced by the solenoid at the start of plunger travel must always be greater than the load requires.

The hammer blow or impact energy is the difference between the solenoid energy and the load energy when the solenoid plunger reaches its seating position. It is this impact energy which ultimately causes the solenoid to fail mechanically. Ultimate in mechanical life is realized when the solenoid energy equals the load energy at the time the solenoid plunger reaches its seated position.

5 Don't Use an Oversize Solenoid

Use of oversize solenoids is inefficient, resulting in higher initial cost, a physically larger unit and greater power consumption. Since energy produced by a solenoid is constant regardless of the load, any energy not expended in useful work must be absorbed by the solenoid in the form of impact forces. This results in reduced mechanical life and subjects the linkage mechanism to unnecessary strain.

6 Consider Carefully, Positive Plunger Seating

The solenoid plunger must seat properly or the coil will overheat, reducing solenoid life. The mechanism must have overtravel; a spring-loaded connecting means between the solenoid and the load will provide the necessary overtravel.

ORDERING INFORMATION

Before using the ordering information, be sure to read the above section. The ordering information contained in this bulletin is for a-c, 60 Hertz only. For other frequencies, d-c, or special applications, refer to your nearest General Electric Sales Office or Distributor.

1. Determine if you require a push or pull form.

Example: Assume we are applying the solenoid to a door latch, and a pull form is required.

2. Determine the maximum stroke required to perform the operation.

Example: For the door latch assume a ½ inch maximum stroke.

3. Determine the force required to perform the desired operation.

Example: For our example, assume we need 2.7 pounds.

4. Turn to ordering information for the length of stroke and type required (page 6, 8, or 10).

Example: For our example turn to page 6, Ordering information for ½ and 1 inch pull.

5. From the column headed "Force in lbs. at 85% voltage (Rec'd load)" find the force you require or the nearest higher force. In the column headed "CR 9500-" read the form you require.

Example: For our 2.7 lbs. force, read A100 solenoid.

6. Check the force curve for the selected form (page 7, 9, or 11) to see that the solenoid meets the load throughout its length of travel.

Example: Check our solenoid against the force curve titled "A100 — 60 Hertz — ½ and 1 inch stroke" on page 7.

7. Check the duty cycle requirements of your application against the duty cycle information given for your form in the table under "Duty Cycle".

Example: The duty cycle for our CR9500-A100 solenoid is 240 operations/min which is sufficient for the application.

8. Specify the type mounting required. This is done by adding one of the following suffix letters to the solenoid form:

A — end mounting
B — right side mounting
C — throat mounting
D — thru-bolt mounting
E — left side mounting
F — both side mounting

Example: For the door latch we want an end mounted solenoid, so we would specify a CR9500A100A.

9. Specify the 60 Hertz coil voltage required from the following table:

No.	Volts
2A	115
3A	230
4A	460
5A	575

Add this number after the suffix number determined in step 8.

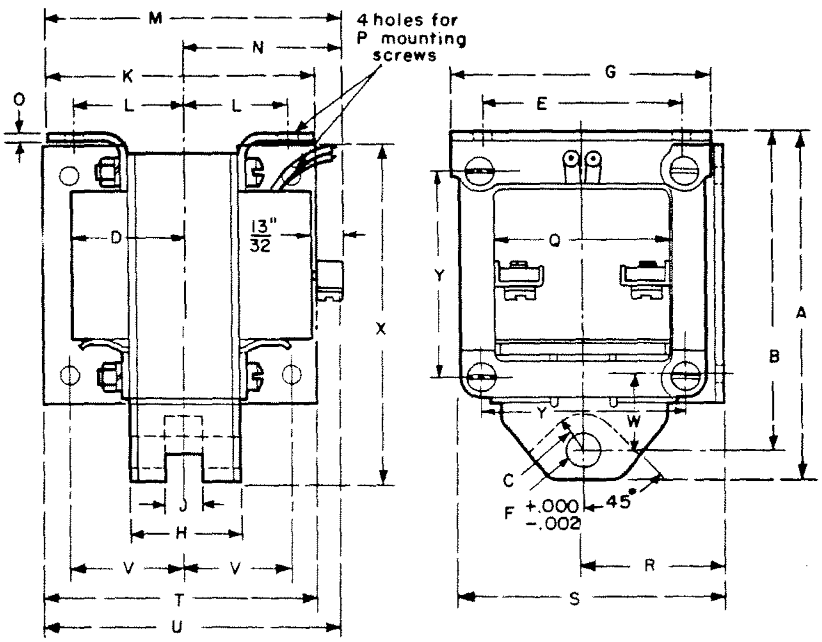
Example: For a 115 volt coil we would add 2A. We would then have CR9500A100 A2A.

10. Order the complete CR number.

Example: Order a CR9500A100A2A.

ORDERING INFORMATION ½ AND 1 INCH PULL†

CR9500	Quiet Force Seated (Lbs.) 85% Voltage	Quiet Force Seated (Lbs.) 100% Voltage	Plunger Weight (Lbs.)	Shipping Weight (Lbs.)	Volt-Amps 100% Voltage Seated	½ INCH MAXIMUM STROKE: Force in Lbs. Horizontal ‡ 85% Voltage	½ INCH MAXIMUM STROKE: Volt-Amps 100% Voltage	½ INCH MAXIMUM STROKE: Duty Cycle 50% Time On (Ops/min)	1 INCH MAXIMUM STROKE: Force in Lbs. Horizontal ‡ 85% Voltage	1 INCH MAXIMUM STROKE: Volt-Amps 100% Voltage	1 INCH MAXIMUM STROKE: Duty Cycle 50% Time On (Ops/min)
A 100	7	9	.2	1.3	40	2.7	230	240	1.0	300	60
A 101	9	12	.3	1.5	50	4.0	322	190	1.7	400	48
A 102	11	15	.3	1.7	50	4.7	420	180	2.3	590	47
B 100	11	15	.4	2.3	60	6.2	520	200	3.9	800	56
B 101	13	18	.5	2.6	70	9.6	790	109	5.5	1050	30
B 102	18	25	.7	3.1	100	14.2	1080	95	9.3	1570	27
C 100	25	35	.8	3.9	100	14.8	1220	125	11.0	1880	31
C 101	33	45	1.1	4.9	130	21.0	1670	124	17.5	2700	30
C 102	43	60	1.5	5.8	160	31.0	2380	82	27.0	3900	22



1" MAXIMUM STROKE PULL TYPE — 60 HERTZ

LETTER DIMENSIONS IN INCHES WITH FEET SIDE MOUNTED (For estimating only)

CR9500	R	S	T	U	V	W	X
A 100	1 1/8	2 1/16	2 1/8	2 35/64	55/64	41/64	2 19/32
A 101	1 1/8	2 1/16	2 5/16	2 47/64	61/64	41/64	2 19/32
A 102	1 1/8	2 1/16	2 1/2	2 59/64	1 1/64	41/64	2 19/32
B 100	1 11/32	2 15/32	2 3/4	3	1 5/32	7/8	3 9/32
B 101	1 11/32	2 15/32	3	3 1/4	1 9/32	7/8	3 9/32
B 102	1 11/32	2 15/32	3 3/8	3 41/64	1 15/32	7/8	3 9/32
C 100	1 49/64	3 13/64	3 7/16	3 5/8	1 25/64	1 3/32	4 3/32
C 101	1 49/64	3 13/64	3 13/16	3 63/64	1 37/64	1 3/32	4 3/32
C 102	1 49/64	3 13/64	4 1/4	4 27/64	1 51/64	1 3/32	4 3/32

1" MAXIMUM STROKE — PULL TYPE — 60 HERTZ

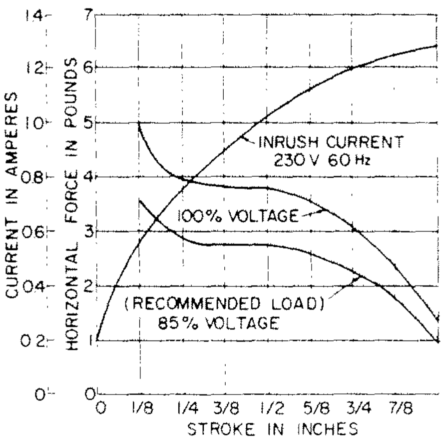
LETTER DIMENSIONS IN INCHES (For estimating only)

CR9500	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	Y
A 100	2 47/64	2 33/64	9/32	.72	1 1/2	.253	1 15/16	5/8	.275	2	51/64	2 21/64	1 31/64	3/32	#8	1.28	1 9/16
A 101	2 47/64	2 33/64	9/32	.83	1 1/2	.253	1 15/16	13/16	.336	2 3/16	57/64	2 43/64	1 37/64	3/32	#8	1.28	1 9/16
A 102	2 47/64	2 33/64	9/32	.91	1 1/2	.253	1 15/16	1	.400	2 3/8	63/64	2 55/64	1 43/64	3/32	#8	1.28	1 9/16
B 100	3 7/16	3 1/8	13/32	.96	1 13/16	.378	2 3/8	7/8	.274	2 9/16	1 1/16	2 59/64	1 5/8	1/8	#10	1.60	1 7/8
B 101	3 7/16	3 1/8	13/32	1.09	1 13/16	.378	2 3/8	1 1/8	.399	2 13/16	1 3/16	3 3/32	1 3/4	1/8	#10	1.60	1 7/8
B 102	3 7/16	3 1/8	13/32	1.28	1 13/16	.378	2 3/8	1 1/2	.524	3 3/16	1 3/8	3 25/64	1 41/64	1/8	#10	1.60	1 7/8
C 100	4 21/64	3 43/64	15/32	1.25	2 1/4	.440	3 1/16	1 1/16	.336	3 3/16	1 17/64	3 1/2	1 29/32	5/32	1/4	1.98	2 3/8
C 101	4 21/64	3 43/64	15/32	1.44	2 1/4	.440	3 1/16	1 7/16	.462	3 5/16	1 29/64	3 55/64	2 3/64	5/32	1/4	1.98	2 3/8
C 102	4 21/64	3 43/64	15/32	1.66	2 1/4	.440	3 1/16	1 7/8	.649	4	1 43/64	4 19/64	2 19/64	5/32	1/4	1.98	2 3/8

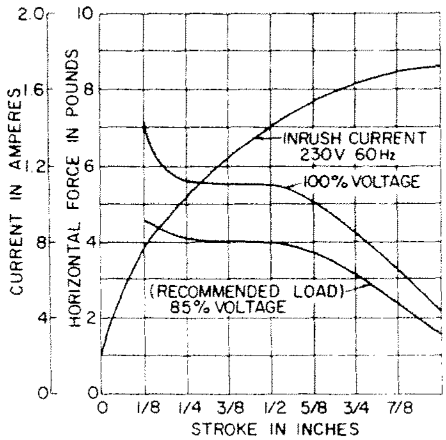
‡ For operation with gravity add plunger weight. For operation against gravity subtract plunger weight.

† Be sure to read "Ordering Information," page 5.

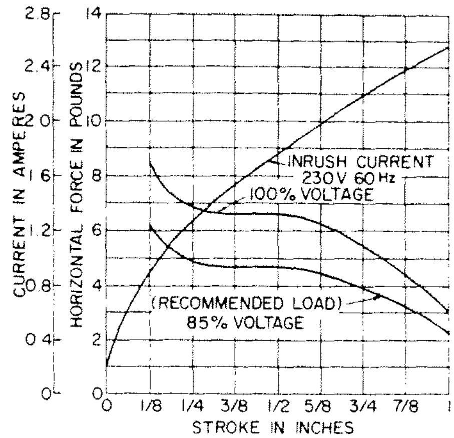
FORCE AND CURRENT CURVES



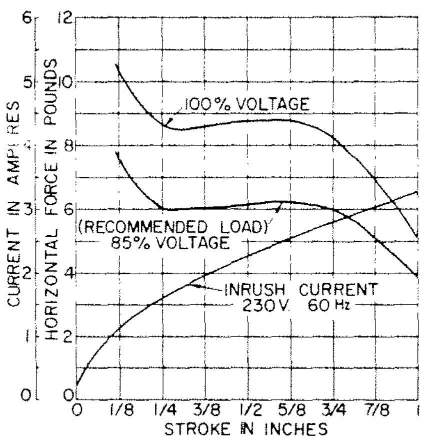
A100 — 60 Hertz — ½ and 1 inch stroke*



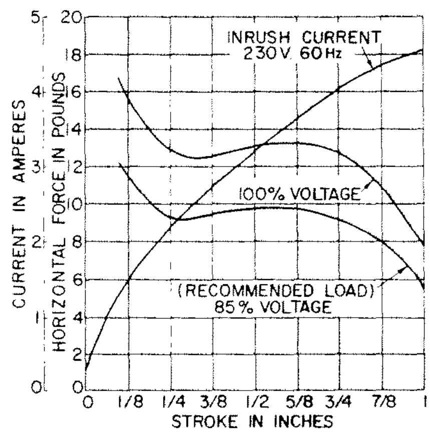
A101 — 60 Hertz — ½ and 1 inch stroke*



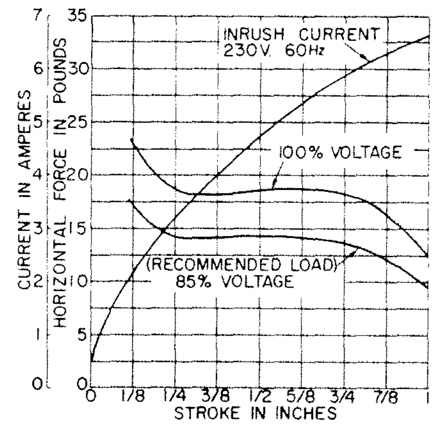
A102 — 60 Hertz — ½ and 1 inch stroke*



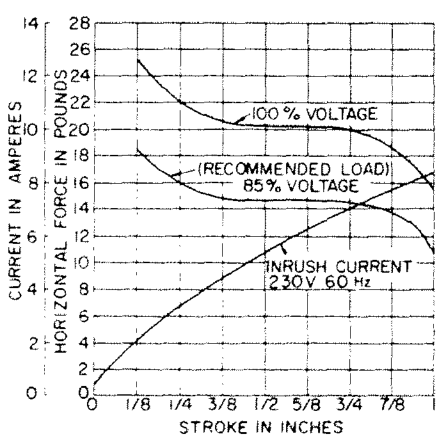
B100 — 60 Hertz — ½ and 1 inch stroke*



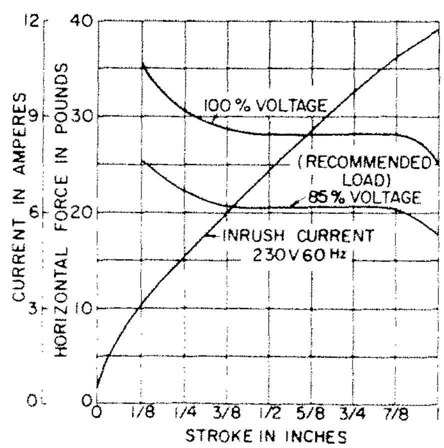
B101 — 60 Hertz — ½ and 1 inch stroke*



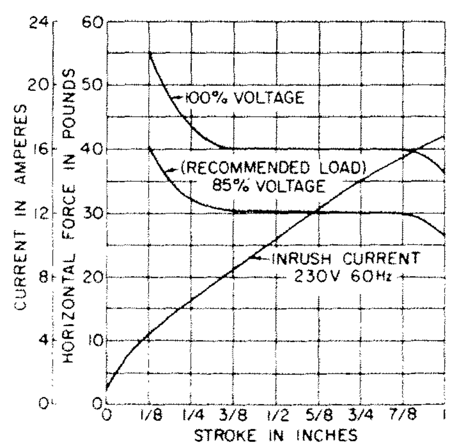
B102 — 60 Hertz — ½ and 1 inch stroke*



C100 — 60 Hertz — ½ and 1 inch stroke*



C101 — 60 Hertz — ½ and 1 inch stroke*

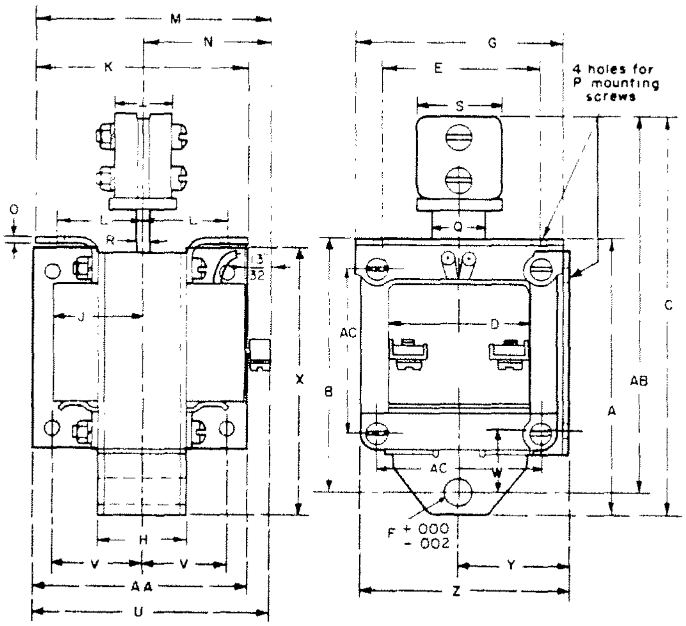


C102 — 60 Hertz — ½ and 1 inch stroke*

*Inrush current given for 230 volts. For 460 volts divide current by 2. For 115 volts multiply by 2.

ORDERING INFORMATION ½ AND 1 INCH PUSH†

½ INCH MAXIMUM STROKE — PUSH TYPE — 60 HERTZ								
CR9500	Force in Lbs. ‡ Horizontal 85% Voltage	Plunger Weight (Lbs.)	Shipping Weight (Lbs.)	Quiet Force Seated (Lbs.)		Duty Cycle 50% Time On (Ops/min)	Volt-Amps 100% Voltage	
				85% Voltage	100% Voltage		Seated	½ Inch
A 103	1.8	.3	1.4	5	6	190	40	180
A 104	3.4	.3	1.6	8	11	160	50	280
A 105	4.1	.4	1.8	11	15	140	50	340
B 103	5.7	.5	2.5	7	9	142	52	450
B 104	8.7	.7	2.8	11	15	118	76	680
B 105	11.8	.8	3.3	16	22	100	80	890
C 103	11.8	1.0	4.5	22	30	110	100	970
C 104	19.2	1.5	5.5	29	40	105	150	1450
C 105	24.0	2.0	6.4	36	50	90	190	2050
1" MAXIMUM STROKE — PUSH TYPE — 60 HERTZ								
B 106	3.0	.5	2.5	7	9	40	52	600
B 107	6.0	.7	2.8	11	15	35	76	990
B 108	7.0	.8	3.3	16	22	30	80	1300
C 106	8.5	1.0	4.5	22	30	28	100	1450
C 107	15.2	1.5	5.5	29	40	26	150	2300
C 108	19.0	2.0	6.4	36	50	22	190	3450



½" MAXIMUM STROKE PUSH TYPE — 60 HERTZ — LETTER DIMENSIONS IN INCHES WITH FEET SIDE MOUNTED (For estimating only)							
CR9500	U	V	W	X	Y	Z	AA
A 103	2 35/64	55/64	41/64	2 19/32	1 1/8	2 1/16	2 1/8
A 104	2 47/64	61/64	41/64	2 19/32	1 1/8	2 1/16	2 5/16
A 105	2 59/64	1 3/64	41/64	2 19/32	1 1/8	2 1/16	2 1/2
B 103	3	1 5/32	7/8	3 9/32	1 11/32	2 15/32	2 3/4
B 104	3 1/4	1 9/32	7/8	3 9/32	1 11/32	2 15/32	3
B 105	3 41/64	1 15/32	7/8	3 9/32	1 11/32	2 15/32	3 3/8
C 103	3 5/8	1 25/64	1 3/32	4 3/32	1 49/64	3 13/64	3 7/16
C 104	3 63/64	1 37/64	1 3/32	4 3/32	1 49/64	3 13/64	3 13/16
C 105	4 27/64	1 51/64	1 3/32	4 3/32	1 49/64	3 13/64	4 1/4
1" MAXIMUM STROKE PUSH TYPE — 60 HERTZ							
B 106	3	1 5/32	7/8	3 9/32	1 11/32	2 15/32	2 3/4
B 107	3 1/4	1 9/32	7/8	3 9/32	1 11/32	2 15/32	3
B 108	3 41/64	1 15/32	7/8	3 9/32	1 11/32	2 15/32	3 3/8
C 106	3 5/8	1 25/64	1 3/32	4 3/32	1 49/64	3 13/64	3 7/16
C 107	3 63/64	1 37/64	1 3/32	4 3/32	1 49/64	3 13/64	3 13/16
C 108	4 27/64	1 51/64	1 3/32	4 3/32	1 49/64	3 13/64	4 1/4

½" MAXIMUM STROKE — PUSH TYPE — 60 HERTZ

LETTER DIMENSIONS IN INCHES (For estimating only)

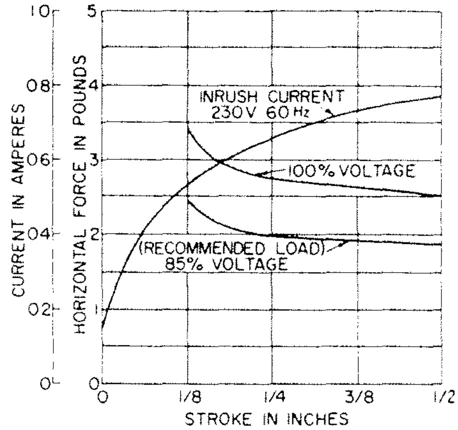
CR9500	A	B	C	D	E	F	G	H	J	K
A 103	2 47/64	2 33/64	3 1/2	1.28	1 1/2	.253	1 15/16	5/8	.72	2
A 104	2 27/64	2 33/64	3 1/2	1.28	1 1/2	.253	1 15/16	13/16	.82	2 3/16
A 105	2 47/64	2 33/64	3 1/2	1.28	1 1/2	.253	1 15/16	1	.91	2 3/8
B 103	3 7/16	3 1/8	4 29/32	1.60	1 13/16	.378	2 3/8	7/8	.96	2 9/16
B 104	3 7/16	3 1/8	4 29/32	1.60	1 13/16	.378	2 3/8	1 1/8	1.09	2 13/16
B 105	3 7/16	3 1/8	4 29/32	1.60	1 13/16	.378	2 3/8	1 1/2	1.28	3 3/16
C 103	4 21/64	3 63/64	5 57/64	1.98	2 1/4	.440	3 1/16	1 1/16	1.25	3 3/16
C 104	4 21/64	3 63/64	5 57/64	1.98	2 1/4	.440	3 1/16	1 7/16	1.44	3 5/16
C 105	4 21/64	3 63/64	5 57/64	1.98	2 1/4	.440	3 1/16	1 7/8	1.66	4
1" MAXIMUM STROKE — PUSH TYPE — 60 HERTZ										
B 106	3 7/16	3 1/8	5 13/32	1.60	1 13/16	.378	2 3/8	7/8	.96	2 9/16
B 107	3 7/16	3 1/8	5 13/32	1.60	1 13/16	.378	2 3/8	1 1/8	1.09	2 13/16
B 108	3 7/16	3 1/8	5 13/32	1.60	1 13/16	.378	2 3/8	1 1/2	1.28	3 3/16
C 106	4 21/64	3 63/64	6 25/64	1.98	2 1/4	.440	3 1/16	1 1/16	1.25	3 3/16
C 107	4 21/64	3 63/64	6 25/64	1.98	2 1/4	.440	3 1/16	1 7/16	1.44	3 5/16
C 108	4 21/64	3 63/64	6 25/64	1.98	2 1/4	.440	3 1/16	1 7/8	1.66	4

CR9500	L	M	N	O	P	Q	R	S	T	AB	AC
A 103	51/64	2 31/64	1 31/64	3/32	#8	.490	3/32	11/16	11/32	3 9/32	1 9/16
A 104	57/64	2 43/64	1 37/64	3/32	#8	.490	3/32	11/16	11/32	3 9/32	1 9/16
A 105	63/64	2 55/64	1 43/64	3/32	#8	.490	3/32	11/16	11/32	3 9/32	1 9/16
B 103	1 1/16	2 59/64	1 5/8	1/8	#10	.552	1/8	1	5/8	4 19/32	1 7/8
B 104	1 3/16	3 5/32	1 3/4	1/8	#10	.552	1/8	1	5/8	4 19/32	1 7/8
B 105	1 3/8	3 35/64	1 41/64	1/8	#10	.552	3/16	1	11/16	4 19/32	1 7/8
C 103	1 17/64	3 1/2	1 29/32	5/32	1/4	.740	1/8	1	7/8	5 35/64	2 3/8
C 104	1 29/64	3 55/64	2 5/64	5/32	1/4	.740	1/8	1	7/8	5 35/64	2 3/8
C 105	1 43/64	4 19/64	2 19/64	5/32	1/4	.740	1/4	1	1	5 35/64	2 3/8
1" MAXIMUM STROKE — PUSH TYPE — 60 HERTZ											
B 106	1 1/16	2 59/64	1 5/8	1/8	#10	.552	1/8	1	5/8	5 5/32	1 7/8
B 107	1 3/16	3 5/32	1 3/4	1/8	#10	.552	1/8	1	5/8	5 5/32	1 7/8
B 108	1 3/8	3 35/64	1 41/64	1/8	#10	.552	3/16	1	11/16	5 5/32	1 7/8
C 106	1 17/64	3 1/2	1 29/32	5/32	1/4	.740	1/8	1	7/8	6 3/4	2 3/8
C 107	1 29/64	3 55/64	2 5/64	5/32	1/4	.740	1/8	1	7/8	6 3/4	2 3/8
C 108	1 43/64	4 19/64	2 19/64	5/32	1/4	.740	1/4	1	1	6 5/64	2 3/8

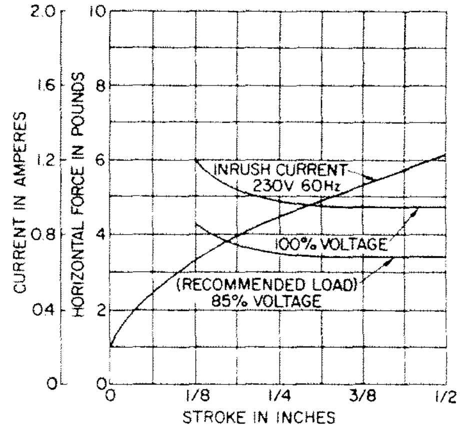
‡ For operation with gravity add plunger weight. For operation against gravity subtract plunger weight.

† Be sure to read "Ordering Information," page 5.

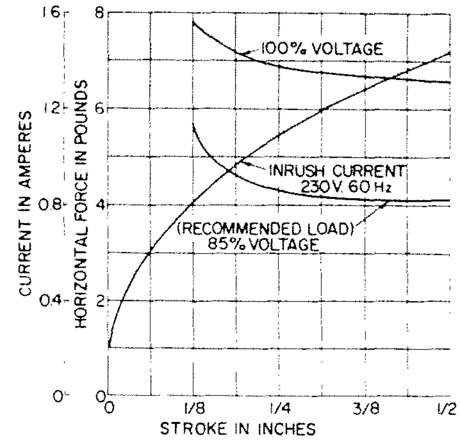
FORCE AND CURRENT CURVES



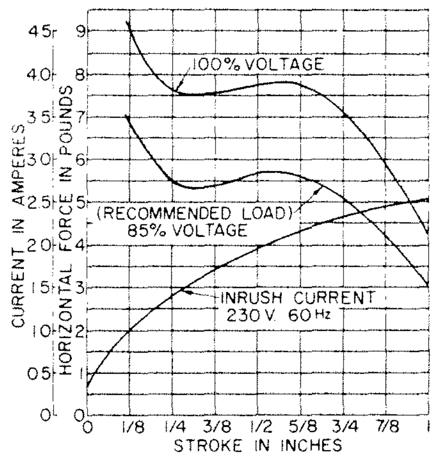
A103 — 60 Hertz — ½ inch max. stroke*



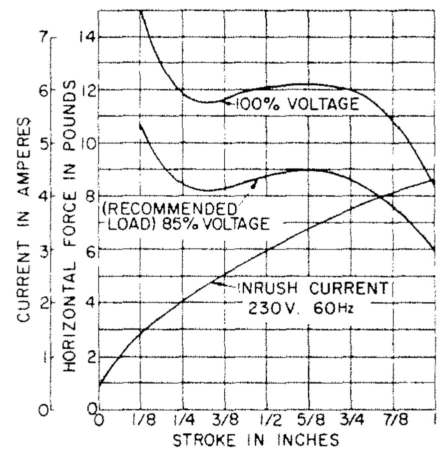
A104 — 60 Hertz — ½ inch max. stroke*



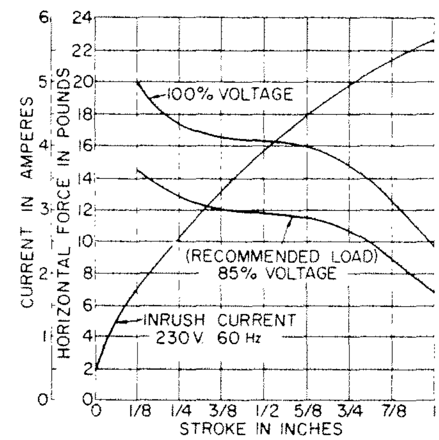
A105 — 60 Hertz — ½ inch max. stroke*



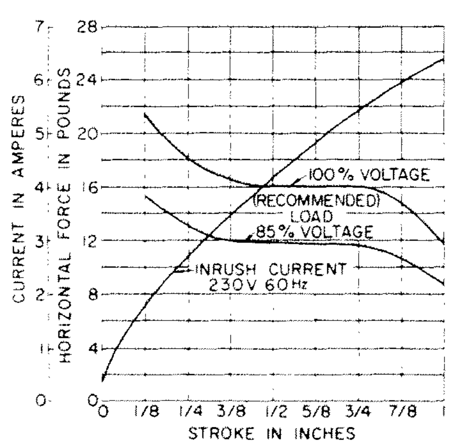
B103 — 60 Hertz — ½ inch max. stroke*
B106 — 60 Hertz — 1 inch max. stroke*



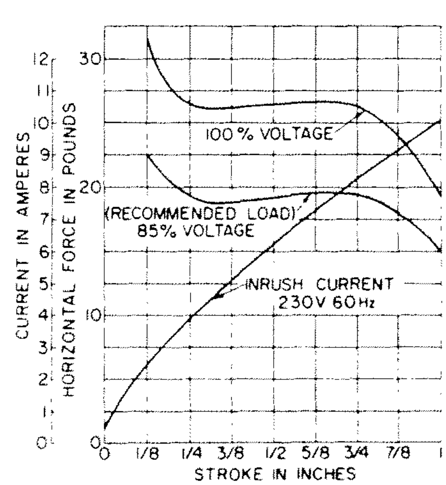
B104 — 60 Hertz — ½ inch max. stroke
B107 — 60 Hertz — 1 inch max. stroke*



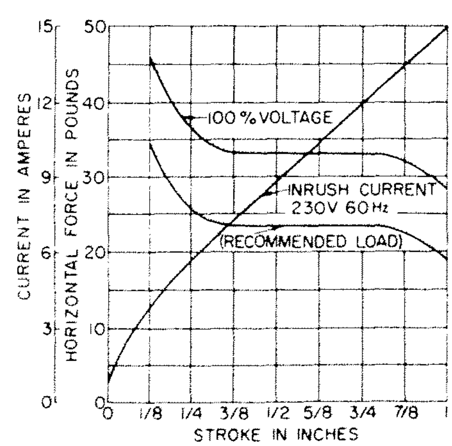
B105 — 60 Hertz — ½ inch max. stroke*
B108 — 60 Hertz — 1 inch max. stroke*



C103 — 60 Hertz — ½ inch max. stroke*
C106 — 60 Hertz — 1 inch max. stroke*



C104 — 60 Hertz — ½ inch max. stroke*
C107 — 60 Hertz — 1 inch max. stroke*



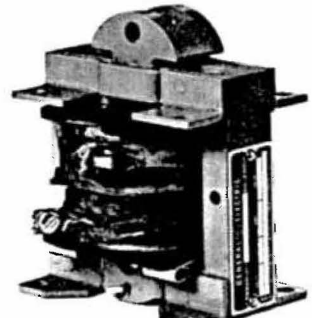
C105 — 60 Hertz — ½ inch max. stroke*
C108 — 60 Hertz — 1 inch max. stroke*

*Inrush current given for 230 volts. For 460 volts divide current by 2. For 115 volts multiply by 2.

CR9503 Industrial Solenoids

Completing the line of General Electric solenoids is the CR9503 industrial unit rated 600 volts maximum, a-c and d-c. This rugged solenoid is available for replacement of existing CR9503 solenoids or for use where applications require more force or stroke than is available with the CR9500 form.

Typical applications include use on brakers, conveyors, gates, switches, safety devices, punch presses, clutches, machine tools, door openers and valves.



CR9503-206 and -211 to -215 pull-type solenoids

***A-C SUFFIX NUMBER** (Add to Nomenclature in table below)

Voltage 60 Hertz	Size of Solenoid CR9503-										
	206B	207E	208D	209C	209M	210C	211E	212B	213C	214B	215C
110	202	202	202	202	204	201	271	207	204	213	212
120	349	......	377	289	232	260	499	293	254	247	307
200	334	......	251	293	233	......	513	298	236		310
220	201	203	203	201	234	202	272	201	201	209	245
240	263	......	384	529	......	240	509	265	247	252	265
380	442	......	......	557	......	......	593	299	312	249	292
400	409	......	......	531	......	287	559	297	......	242	
440	203	204	204	204	235	203	273	205	203	210	246
480	348	......	494	502	236	237	523	285	309	243	274
500	453	......	412	523	237	......	514	......	234	241	224
550	204	205	205	226	238	204	274	206	205	211	247

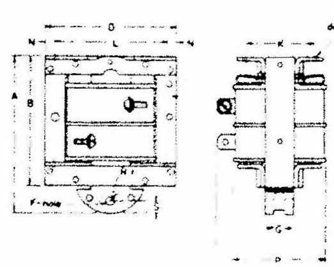
ORDERING INFORMATION A-C SOLENOIDS (Maximum Ambient Temperature 40° C)

Max. Stroke in Inches	Recommended Load in Lbs.					Gross Pull or Push at Rated Voltage in Lbs.					Weight of Plunger in Lbs.		Pull Type	Push Type	Approx. Ship. Weight in Lbs.
	Exclusive of Plunger Weight	For Operation With Gravity (Weight of Plunger Added)		For Operation Against Gravity (Less Plunger Weight)		Exclusive of Plunger Weight	For Operation With Gravity (Weight of Plunger Added)		For Operation Against Gravity (Less Plunger Weight)				Form	Form	
		Pull Type	Push Type	Pull Type	Push Type		Pull Type	Push Type	Pull Type	Push Type	Pull Type	Push Type			
3/4	0.65	0.77	......	.53	......	0.9	1.02	......	.78	......	0.12	......	CR9503 207E AB*	....	2
1	0.9	1.08	......	.72	......	1.3	1.48	......	1.12	......	0.18	......	CR9503 208D AB*	....	2
1	3.2	3.51	3.7	2.89	2.7	4.5	4.81	5.0	4.19	4.0	0.31	0.5	CR9503 209C AB*	CR9503 209C AC*	2 1/2
1 1/4	4.0	4.56	4.8	3.44	3.2	6.0	6.56	6.8	5.44	5.2	0.56	0.8	CR9503 210C AB*	CR9503 210C AC*	4 1/2
1	5.5	6.18	6.38	4.82	4.62	8.0	8.68	8.88	7.32	7.12	0.68	0.88	CR9503 209M AB*	CR9503 209M AF*	4 1/2
1 1/4	10.2	11.14	11.39	9.26	9.01	14.0	14.94	15.19	13.06	12.81	0.94	1.19	CR9503 211E AB*	CR9503 211E AC*	7 1/2
1 3/4	22.7	25.1	26.1	20.3	19.3	30.0	32.4	33.4	27.6	26.6	2.44	3.38	CR9503 206B AB*	CR9503 206B AC*	10
2	21.7	25.0	26.5	18.5	17.0	30.2	33.5	35.0	27.0	25.5	3.25	4.75	CR9503 212B AB*	CR9503 212B AF*	24
2	42.0	47.4	49.1	36.6	34.9	64.0	69.4	71.1	58.6	56.9	5.44	7.12	CR9503 213C AB*	CR9503 213C AF*	31
3	51.0	61.0	67.0	41.0	35.0	73.0	83.0	89.0	63.0	57.0	10.0	16.0	CR9503 214B AB*	CR9503 214B AF*	67
3	70.0	83.0	89.0	57.0	51.0	97.0	110.0	116.0	84.0	78.0	13.0	19.0	CR9503 215C AB*	CR9503 215C AF*	90

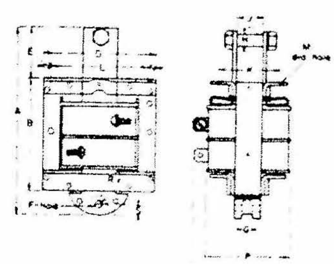
DIMENSIONS (for estimating only)

CR9503 Size	Type of Operation	APPROXIMATE DIMENSIONS IN INCHES															
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S
207E	Pull	2 19/32	2 1/16	2 3/16	2 3/32	.....	0.193	1/4	...	...	1 1/8	1 5/8	8/32 tap	7/32	1 9/16	.....	1/4
208D	Pull	2 25/32	2 1/16	2 7/16	2 3/32	.....	.193	15/64	...	...	1 3/8	2	.180	7/32	1 13/16	.....	1/4
209C	Pull	3 7/16	2 7/8	2 7/8	2 5/8	.....	.193	15/64			1 7/16	2 1/4	3/16	3/16	2 1/4	1/4	3/16
209C	Push	5 9/16	2 7/8	2 7/8	2 3/8	2 1/8	.193	15/64	1/4	21/32	1 7/16	2 1/4	3/16	3/16	2 1/4	1/4	3/16
209D	Pull	3 7/16	2 7/8	2 7/8	2 5/8		.193	15/64			1 7/16	2 1/4	3/16	3/16	2 1/4	1/4	3/16
209M	Pull	3 7/16	2 7/8	2 7/8	2 5/8		.193	15/64			1 43/64	2 1/4	3/16	3/16	2 1/4	1/4	3/16
209M	Push	5 9/16	2 7/8	2 7/8	2 3/8	2 1/8	.193	15/64	1/4	21/32	1 43/64	2 1/4	3/16	3/16	2 1/4	1/4	3/16
211E	Pull	4 15/32	3 11/16	3 3/4	3 11/16		.312	7/16			2 1/4	3 1/8	9/32	9/32	3 1/8	3/8	5/16
211E	Push	7 3/32	3 11/16	3 3/4	3 11/16	2 5/8	.312	7/16	7/16	1/16	2 1/4	3 1/8	9/32	9/32	3 1/8	3/8	5/16
206B	Pull	5 13/16	4 3/4	4 5/16	4 3/4		.385	9/16			2 13/16	4	11/32	3/8	3 11/16	9/16	3/8
206B	Push	8 15/16	4 3/4	4 5/16	4 3/4	3 1/8	.385	9/16	1/2	1 3/8	2 13/16	4	11/32	3/8	3 11/16	9/16	3/8
212B	Pull	7 3/16	5 7/8	4 13/16	5 3/4		.510	9/16			2 15/16	4 3/4	13/32	1/2	4 3/16	9/16	7/16
212B	Push	11 1/8	5 7/8	4 3/4	5 3/4	4	.510	9/16	5/8	1 3/8	2 15/16	4 3/4	13/32	1/2	4 1/8	9/16	7/16
213C	Pull	7 3/16	5 7/8	5 11/16	5 3/4		.510	9/16			3 7/8	4 3/4	13/32	1/2	5 1/16	9/16	7/16
213C	Push	11 1/8	5 7/8	5 11/16	5 3/4	4	.510	9/16	5/8	2 15/16	3 7/8	4 3/4	13/32	1/2	5 1/16	9/16	7/16
214B	Pull	10	8 1/4	6 1/2	8 1/4		.630	11/16			4 7/16	7	17/32	5/8	5 7/8	11/16	5/8
214B	Push	15 1/2	8 1/4	6 1/2	8 1/4	5 1/2	.630	11/16	3/4	1 7/8	4 7/16	7	17/32	5/8	5 7/8	11/16	5/8
215C	Pull	10	8 1/4	7 1/8	8 1/4		.630	11/16			5 1/8	7	17/32	5/8	6 1/2	11/16	5/8
215C	Push	15 1/2	8 1/4	7 1/8	8 1/4	5 1/2	.630	11/16	3/4	2 9/16	5 1/8	7	17/32	5/8	6 1/2	11/16	5/8

CR9503-207 and -208 only



All other a-c pull type



All other a-c push type

MAXIMUM DUTY CYCLE

(Operations per Minute)

The adjoining table gives typical maximum operating speeds for the 60-Hertz, a-c solenoids listed. The ratings are based on operation at rated voltage with the recommended load shown in the table.

CR9503 Solenoid	Recommended Load Lb.	60 HERTZ, ALTERNATING CURRENT — 25 Percent Time on — Percent Stroke 50	25 % — 75	25 % — 100	50 Percent Time on — Percent Stroke 50	50 % — 75	50 % — 100	75 Percent Time on — Percent Stroke 50	75 % — 75	75 % — 100
		No. of Operations per Minute								
206B	22.7	58	24	11.5	42	18	10	18	12	6.5
207E	0.65	220	100	39	160	67	28	115	41	19
208D	0.9	150	71	25	130	58	20	78	36	15
209C	3.2	85	42	19	68	37	17	62	33	15
209M	5.5	85	42	19	68	37	17	62	33	15
211E	10.2	70	31.5	13.5	60	27	12	50	22	11
212B	21.7	65	29	14	51	24	11.5	40	21.4	9
213C	42.0	54	22	12	45	19	9	36	14.5	6
214B	51.0	45	27	13	35	20	9	25	13	6
215C	70.0	40	25	13	26	15	9	18	10	6

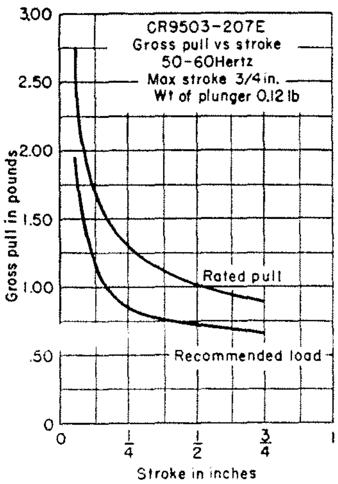
PULL CURVES

Pull shown is exclusive of plunger weight. When operating with gravity add weight of plunger. When operating against gravity subtract weight of plunger. Data below is taken with coil at 125 C.

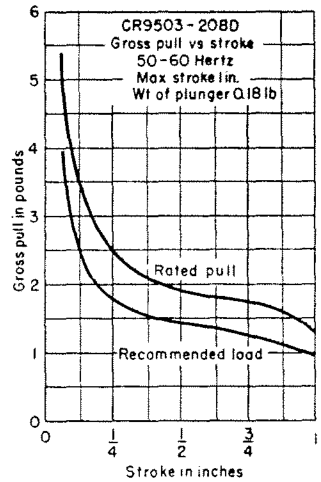
COIL RATING IN VOLT-AMPERES

Size of Solenoid CR9503	60 Hertz — Max. Stroke (Inrush)	60 Hertz — Min. Stroke (Holding)
206B	5450	390
207E	110	25
208D	210	35
209C	500	55
209M	750	85
211E	1970	165
212B	6900	510
213C	12600	715
214B	24200	1290
215C	31200	1760

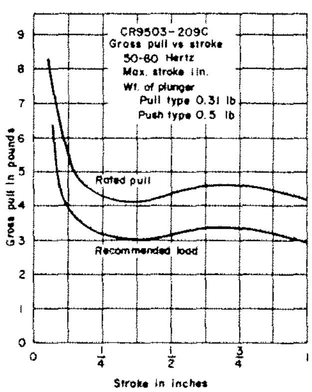
For information on CR9503 d-c forms, contact your General Electric Sales Office.



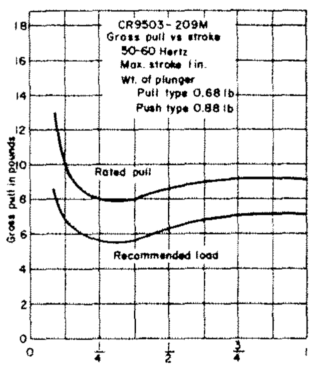
CR9503-207E



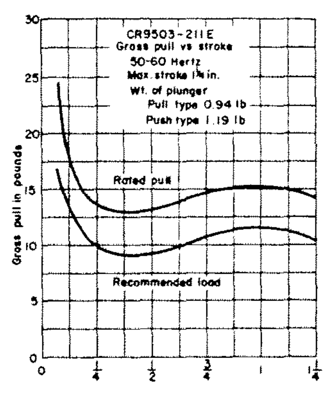
CR9503-208D



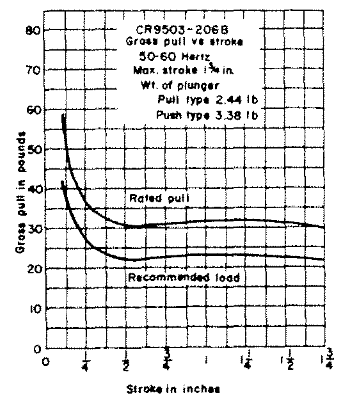
CR9503-209C



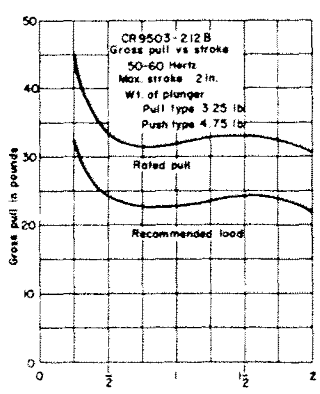
CR9503-209M



CR9503-211E



CR9503-206B



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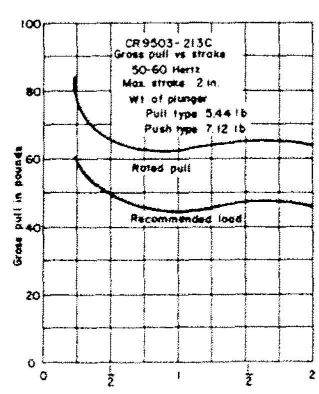
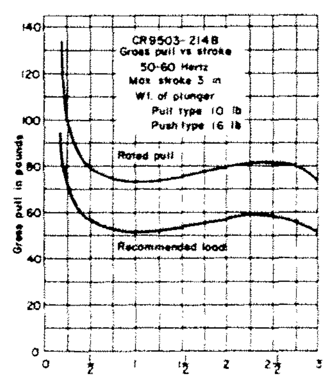
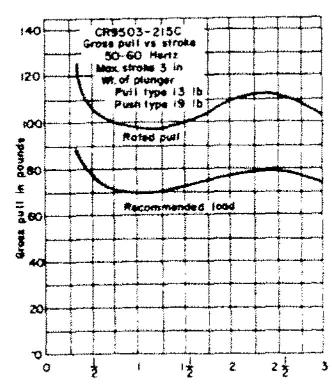


CR9503-213 C



CR9503-214B



CR9503-215C

control

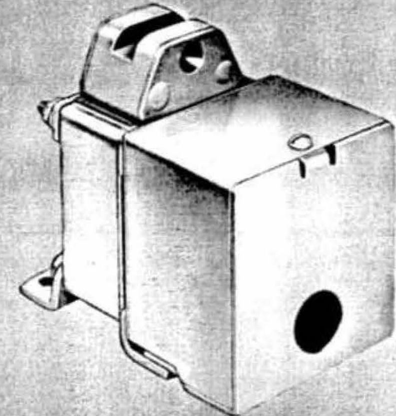
accessories and d-c forms for CR9500 solenoids

TERMINAL COVERS

Terminal covers are used on the strongbox solenoid for greater protection of personnel, and for easier wiring of conduit or cable. The covers protect personnel against accidental contact with the terminals, when the terminals are used as junction points for the incoming power.

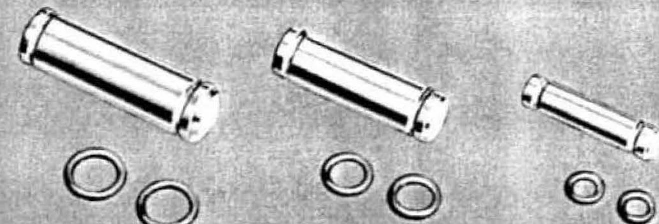
For easier wiring, the covers serve as conduit boxes for ¾-inch conduit, or ¾-inch armored cable connectors. The covers, made of 3/32-inch sheet steel, can be used for solenoids in any mounting position.

Slotted mounting holes provide easy mounting of the terminal covers to the solenoid with the solenoid mounting screws. Also, two holes are provided for mounting to the machine bedplate if desired.



LINKAGE PINS

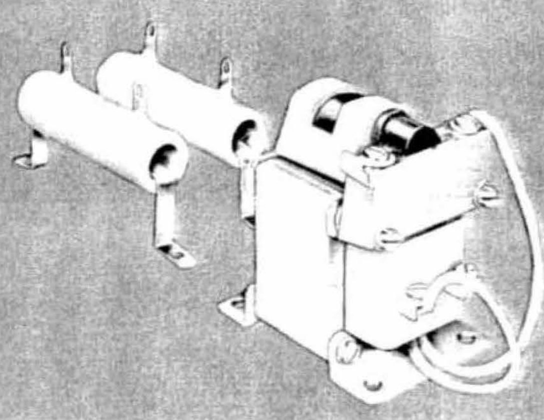
Linkage pins provide an easy method of connecting the load to pull-type solenoids. The linkage pins, made of centerless-ground, chrome-moly steel, reduce linkage-pin breaks, because of their high strength and durability.



D-C SOLENOID FORMS

D-c forms of the General Electric strongbox solenoid are available in all ratings, laminations, strokes and sizes for both push and pull operation.

In all sizes, laminations "A", "B" and "C", a small cutout switch is included with the solenoid. This switch reduces the sealed-in current by inserting resistance in series with the strongbox coil. On "C" lamination size solenoids, a capacitor is also included for arc suppression. The resistor, and capacitor when necessary, are furnished with the solenoid.



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