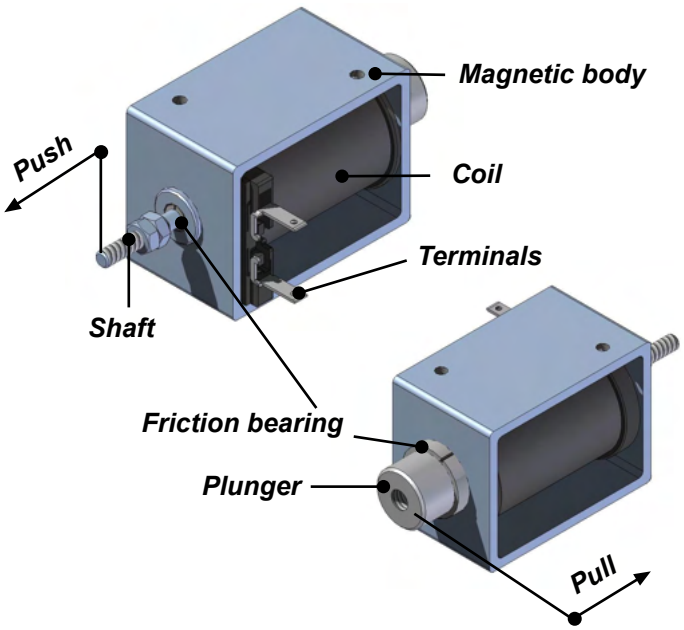
ERC SERIE

ERC serie electromagnets are simple effect linear solenoids where the stroke movement from initial to final position is made by electromagnetic forces, the return to initial position is made by external force or by a spring incorporated to the solenoid. They are similar to ER series but with a higher life expressed in number of cycle due to its guide made in friction bearing with teflon layer.



Structure, basic elements:

Magnetic body:
It is the metal piece containing the coil, the core, the fixing holes of the solenoid and friction bearing.

Coil:
It receives the electric energy to create the magnetic field.

Plunger:
It is the piece that moves inside the coil, and it has a non-magnetic shaft fixed toit. To work pulling, the element to activate must be fixed to the plunger. To work pushing, the element to activate must be fixed to the axis.

Friction bearing:
They are the guide of the plunger, and abrasion resistant.

Data sheet rated values conditions:

The values of the magnetic force (Fm) depending on the stroke, are obtained in the following conditions:
Room temperature = 35ºC
Coil stabilized at its working temperature.
Rated voltage equal to 90% of the standard one.
Solenoid working in horizontal position.

Effective force (Fh) is obtained from magnetic force (Fm).

1) When the solenoid pulls upwards:

Effective force = Magnetic force - Plunger weight

2) When the solenoid pulls downwards:

Effective force = Magnetic force + Plunger weight

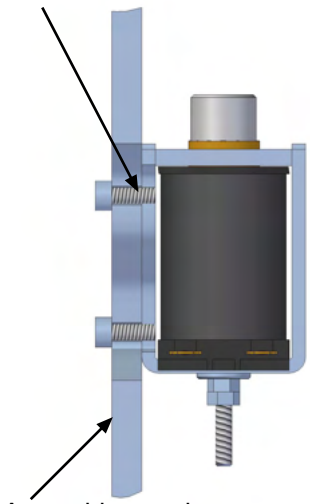
3) When the solenoid pulls in horizontal position:

Effective force = Magnetic force

-For the units with incorporated return spring:

Effective force = Magnetic force - Spring force ± Plunger weight

Important: The fixation screws do not have to exceed the wall of the magnetic body not to damage the coil



Under demand, terminals can be replaced by flying leads.

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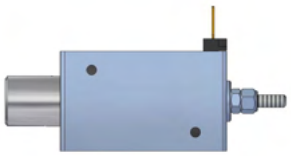
Chart: force-stroke

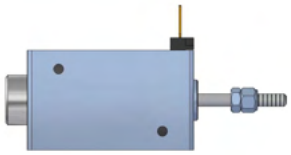
Type	Stroke (mm)	Magnetic force "Fm" (N) Duty cycle 100%	40%	25%	15%	5%	Return spring force (N)
ERC25-04/CC	Beginning of stroke s_1=4	4.4	8.2	10.6	14	23	1.98
	End of stroke s_0=0	12.4	17.6	20.6	25.4	36.8	3.57
ERC30/C	Beginning of stroke s_1=8	3	6	9	12	21	0.59
	End of stroke s_0=0	10	15	19	24	35	1.57
ERC35/C	Beginning of stroke s_1=12	2.6	5.8	7.9	10.5	21	0.78
	End of stroke s_0=0	5.6	9.5	12.9	18	27.7	1.96
ERC45-50-15/C	Beginning of stroke s_1=15	4.5	9.3	12	16	32	1.76
	End of stroke s_0=0	16	33	42	50	83	3.62
ERC50-15/C	Beginning of stroke s_1=15	6.8	12.8	17	23	43	1.76
	End of stroke s_0=0	20	34	42	52	76	3.62
ERC60-10/C	Beginning of stroke s_1=10	19	33	43	56	94	3.21
	End of stroke s_0=0	81	119	140	160	191	4.3
ERC60-20/C	Beginning of stroke s_1=20	11	19	24	32	57	2.12
	End of stroke s_0=0	56	86	106	124	160	4.3

The values of force-stroke and the return spring are in Newton (N), solenoid in horizontal position and without return spring.

Beginning of stroke (s_1)



End of stroke (s_0)



CUSTOMIZATION: ERC SERIE

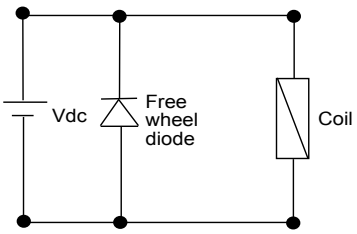
The models described in the catalogue are standard and minimum manufacturing batches are not required. However, there is the possibility of customizing them to suit better customer's needs. See below some of the most common customizations.
If any modification is needed, please ask NAFSA about the possibility and the minimum manufacturing batch required.

1. ELECTRICAL CUSTOMIZATION:

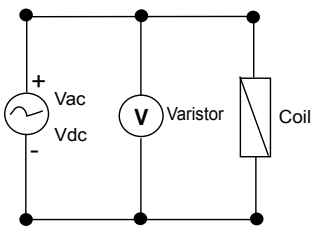
a) Integrated electronics over the coil:

a.1) For peak supression
Examples:

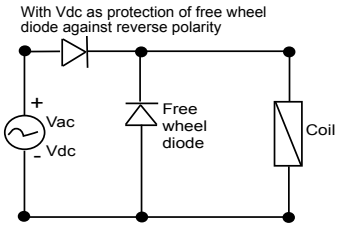
*Free wheel diode



*Varistor

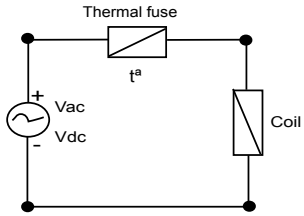


*Free wheel diode+second diode to protect the free wheel diode against reverse polarity



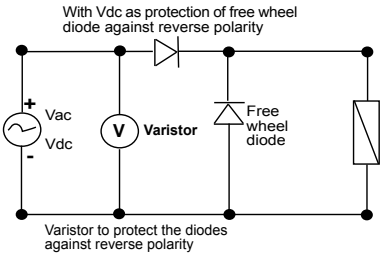
a.2) Thermal protection
Examples:

*The thermic resettable polyswitchs are used in coils with low duty cycles against overheating, caused by long time under voltage and not respected the duty cycle times.
It can be used also as timer.



a.3) For rectification
Examples:

*Half wave rectification, with free wheel diode and varistor input protection.



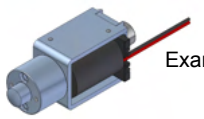
a.4) PWM electronics integration:

It consists on feeding the electromagnet through an electronic PWM (Pulse width modulation). This device will iniattially provide the solenoid with its nominal voltage and after a while, which will be higher than the one needed to complete it´s stroke, the voltage entering to the solenoid will be reduced by the PWD to the selected ratio. For instance, the most common reduction ratio values are 1:2 or 1:3. Once the voltage is reduced it will be maintained in it´s value untill the supply to the solenoid is off, once off, the system resets and when the solenoid works again, the cycle is repeated.

The idea is to make the solenoid to be 100% duty-cycle, but with a big force when the stroke has to be done, the force of a reduced duty cycle, as per example 25%, so it can be feeded long as required but without the risk of burning.

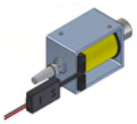
The solution is used when the initial stroke force in a 100% duty-cycle solenoid isn't enough or in those cases where a lower heating of the solenoid is required. For example, a 12Vdc and ED100% solenoid can be feeded at 24VDC throught an PWM electronic and if it has 1:2 ratio, the solenoid will first see the 24VDC so it will complete the stroke with 4 times more power, so with the force of a 25% duty cycle, then when the voltage is reduced to 12VDC the duty cycle will be 100%.

***PWD over coil**



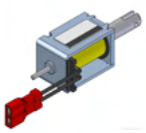
Example 1:

***PWD over the cables**

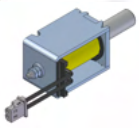


Example 2:
ERC30CGE-EC

Example 3:



Example 4:



b) Cable length modification and terminal or connector mounted over cables:
All ERC models terminals can be replaced by supply cables. The standard length of cables is 250mm, this dimension can be modified to customer requirement.
Likewise,many different kind of terminals or connectors may be added to the cables.

c) Intermediate duty-cycle manufacturing:
NAFSA can manufacture any intermediate duty-cycle from 0 to 100, but the viability depends on the model and the voltage associated with it. For any special requeriment, please ask NAFSA .

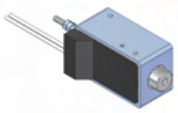
2. INSULATION CLASS CUSTOMIZATION:

In the ER serie maximum insulation class can be obtained is F (155ºC),

3. PROTECTIÓN RATE IP (EN60529) CUSTOMIZATION:

Standard models are IP00, but IP40 can be obtained to the mechanical part and IP65 to the electrical part by coil overmolding process.

Example 5:
ERC35-12 F



NOTE: All this customizations cannot be applied to all models, ask NAFSA for each case.

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CUSTOMIZATION: ERC SERIE

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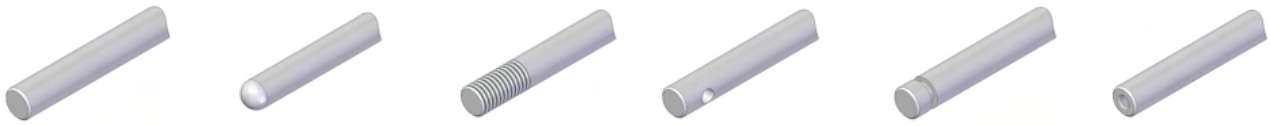
If any modification is needed, please ask NAFSA about the possibility and the minimum manufacturing batch required.

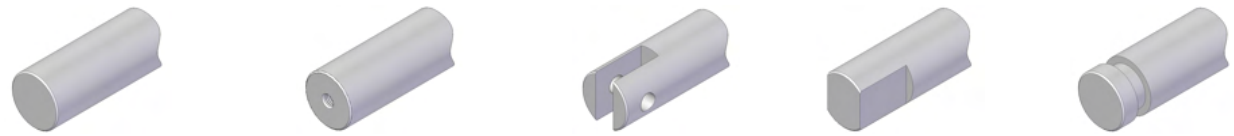
4. MECHANICAL CUSTOMIZATION:

4.1) Shaft modifications: Length and shape can be modified. If it has not any function, it can be removed depending on the model, this would mean use exterior springs instead of internal ones.



a) Flat b) Spherical c) Threaded d) Transverse hole e) Grooved f) Threaded hole

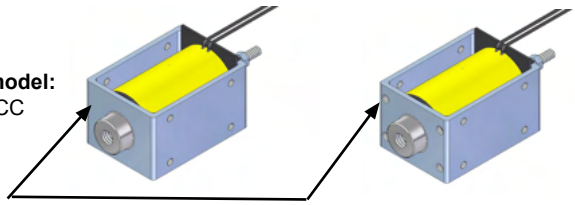
4.2) Plunger modifications: Length and shape can be modified



a) Flat b) Threaded hole c) Fork joint d) Flat faces e) Grooved

4.3) Fixing holes modification:

Standard model:
ERC60-10/CC



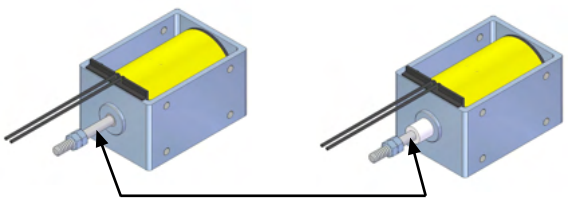
Customized model with extra holes:
ERC60-10/CCAE

4.4) Return spring force modification:
ERC serie electromagnets are linear simple effect solenoids, where the stroke movement from initial to the final position is made by electromagnetic forces, and the return to initial position takes place because of external forces or an incorporated spring (depending on the type). The force of the spring is limited to returning the plunger to the initial position. If more force is required, spring can be modified but we will have to take in mind the duty-cycle. Each duty-cycle has a limitation to increase the spring force, as this force will be deducted to the solenoid push/pull force.

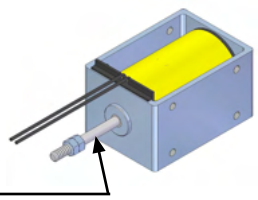
In the cases that spring is not required, solenoid can be ordered without spring or it can be removed manually.

4.5) Stroke modifications:
The standard stroke is limited by the usefull length of shaft, in some cases the stroke can be modified: decreasing or increasing it in case that solenoid has enough ativation force. These modifications can be made by customer or NAFSA.

Example:
Stroke decrease:
Inserting a plastic bearing, this can be made by NAFSA or the customer

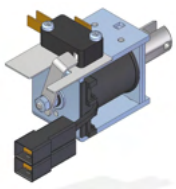


Example:
Stroke increase:
Shaft has been enlarged to increase the stroke, This modifcation only can be made by NAFSA.



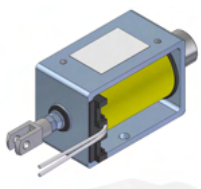
4.6) Position detection system integration:

Example:



4.7) Fastening element added as Fork joints DIN71752:

Example:



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ERC 25-04/CC TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 3 minutes
Standard stroke "s":4 mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: NO (optional)

Product with spring:

Reference:
ERC25-04/CCRS--V ED--%

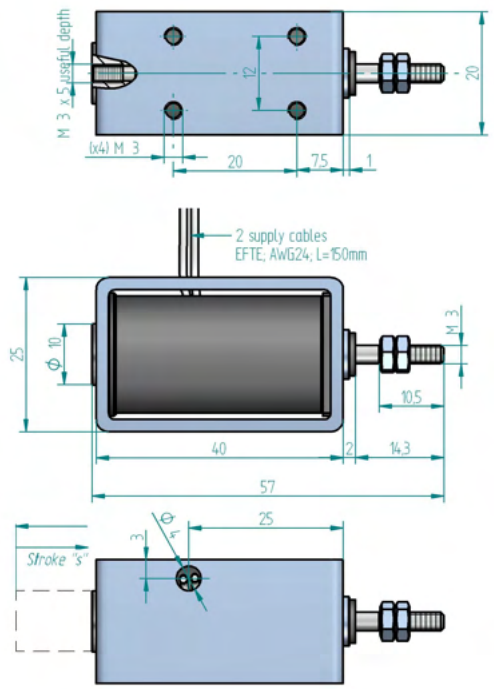
Duty-cycle ED(%)	100	40	25	15	5
Abs power at 20ºC (W)	6.3	15.2	24.7	40.3	123
Minimum force (N)	4.3	8.2	10.6	14	23
Max. time under voltage (s)	∞	72	45	27	9
Plunger weight (g)	20				
Solenoid weight (g)	110				

Duty-cycle ED(%)	Standard voltages									Under demand voltage			
	VDC							VAC		VDC		VAC	
	6	12	24	48	100	125	205	110	230	Min	Max	Min	Max
100%	o	o	o	o	o	o	o	o	o	3	200	24	230
40%	o	o	o	o	o	o	o	o	o	3	230	50	230
25%	o	o	o	o	o	o	o	o	o	3	230	75	230
15%	o	o	o	o	o	o	o	o	o	3	230	125	230
5%	x	o	o	o	o	o	o	o	o	9	230	x	x

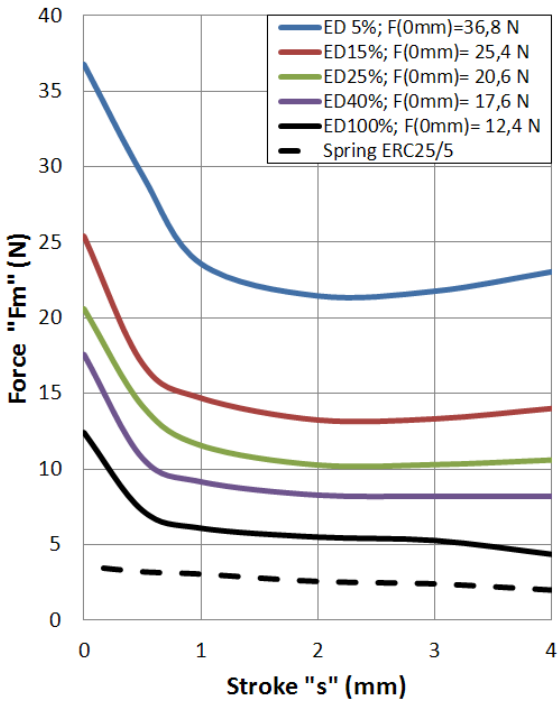
Layout: o = Available ; x = Unavailable

1)Voltage under demand:
They can be manufactured at any voltage between the maximum and minimum voltage values shown in the chart.
2)To feed in alterning current the solenoid will have a rectifier incorporated in the coil.
3)The duty cycles described in the chart are standard, they can be manufactured in any intermediate cycle.
4)If any variation from the original is needed, please ask us.
5)Earthing is recommended if the metallic parts are accessible.

Electroimán representado bajo tensión



Force-stroke curve



Calculation of the efective force: read pages 1 and 31

Ordering code: *ERC 25-04/CC --V ED---%*

Example: Standard voltage:24Vdc; Duty-cycle: ED100%; *ERC25-04/CC 24Vdc ED100%*
Standard voltage:24Vdc; Duty-cycle: ED100%; With spring; *ERC25-04/CCRS 24Vdc ED100%*

For fixation of the solenoid: see page 31

Spring yes: RS; Spring no: RN

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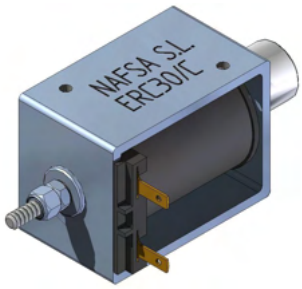
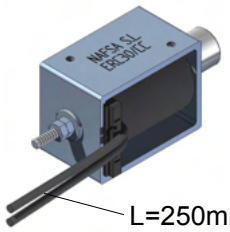
ERC 30/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 2 minutes
Standard stroke "s": 8 mm
Temperature rise: "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: YES



Product with leads:



Reference:
ERC30/CC--V ED--%

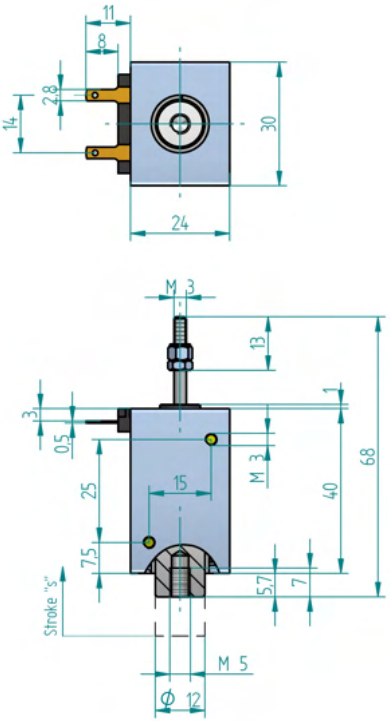
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	8	20	30	50	120
Minimum force (N)	3	6	9	12	21
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)			25		
Solenoid weight (g)			130		

Duty-cycle ED%	Standard voltages									Under demand voltages			
	VDC							VAC		VDC		VAC	
	6	12	24	48	100	125	205	110	230	Min	Max	Min	Max
100%	o	o	o	o	o	o	x	o	o	3	200	24	230
40%	o	o	o	o	o	o	o	o	o	5	230	50	230
25%	o	o	o	o	o	o	o	o	o	6	230	75	230
15%	o	o	o	o	o	o	o	x	o	6	230	125	230
5%	x	o	o	o	o	o	o	x	x	9	230	x	x

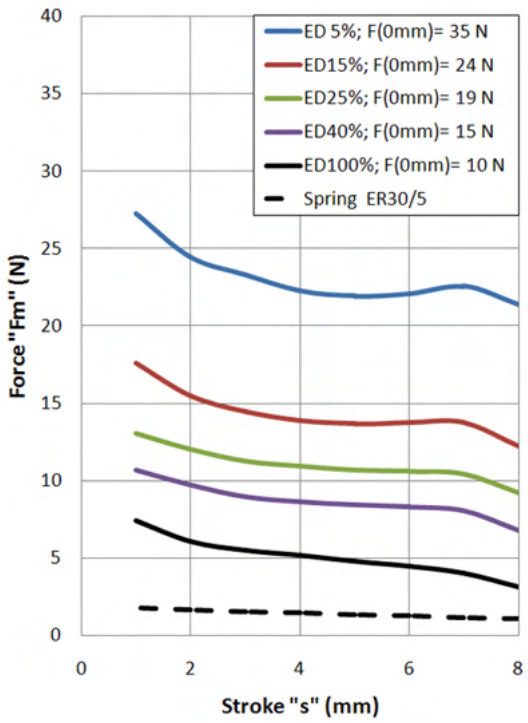
Layout: o = Available ; x = Unavailable

1)Voltage under demand:
They can be manufactured at any voltage between the maximum and minimum voltage values shown in the chart.
2)To feed in alterning current the solenoid will have a rectifier incorporated in the coil.
3)The duty cycles described in the chart are standard, they can be manufactured in any intermediate cycle.
4)If any variation from the original is needed, please ask us.
5)The terminals can be changed by leads.
6)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 31

Ordering code: *ERC30/C --V ED---%* - Spring

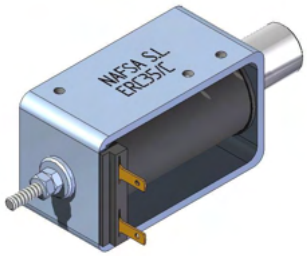
Example: Standard voltage:24Vdc; Duty cycle: ED100%; With spring : *ERC30/C 24Vdc ED100% RS*
Standard voltage:12Vdc; Duty cycle: ED15%; Without spring : *ERC30/C 12Vdc ED15% RN*

For fixation of the solenoid: see page 31

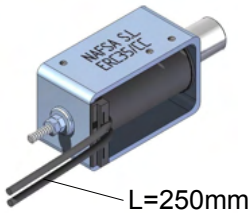
Spring yes: RS; Spring no: RN

ERC 35/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 2 minutes
Standard stroke "s": 12 mm
Temperature rise: "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: YES



Product with leads:



Reference:
ERC35/CC--V ED--

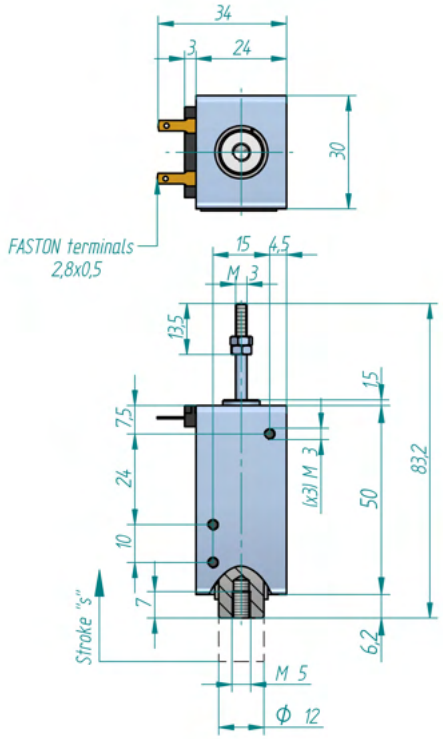
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	9	20	35	60	150
Minimum force (N)	2.6	5.4	7.3	9.6	17.7
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)	35				
Solenoid weight (g)	150				

Duty-cycle ED%	Standard voltages									Under demand voltages			
	VDC							VAC		VDC		VAC	
	6	12	24	48	100	125	205	110	230	Min	Max	Min	Max
100%	o	o	o	o	o	o	x	o	o	4	230	36	230
40%	o	o	o	o	o	o	o	o	o	5	230	75	230
25%	o	o	o	o	o	o	o	o	o	6	230	105	230
15%	x	o	o	o	o	o	o	x	o	8	230	180	230
5%	x	o	o	o	o	o	o	x	x	12	230	x	x

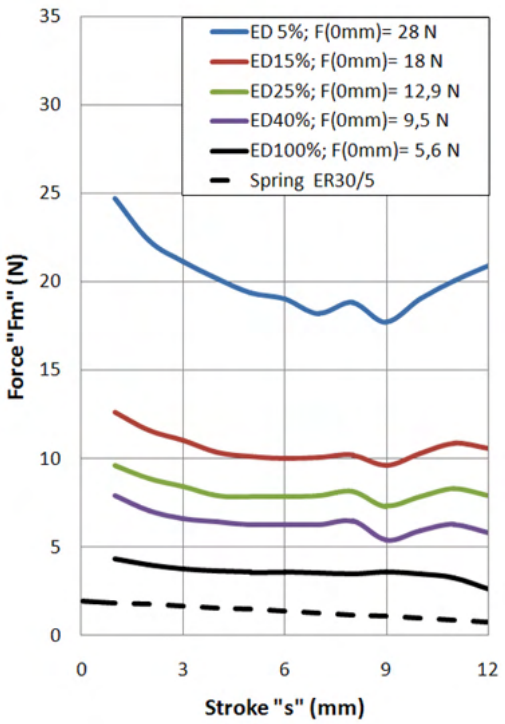
Layout: o = Available ; x = Unavailable

1)Voltage under demand:
They can be manufactured at any voltage between the maximum and minimum voltage values shown in the chart.
2)To feed in alterning current the solenoid will have a rectifier incorporated in the coil.
3)The duty cycles described in the chart are standard, they can be manufactured in any intermediate cycle.
4)If any variation from the original is needed, please ask us.
5)The terminals can be changed by leads.
6)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 31

Ordering code: *ERC35/C --V ED---%* - Spring

Example: Standard voltage:24Vdc; Duty cycle: ED100%: With spring : *ERC35/C 24Vdc ED100% RS*
Standard voltage:12Vdc; Duty cycle: ED15%: Without spring : *ERC35/C 12Vdc ED15% RN*

For fixation of the solenoid: see page 31

Spring yes: RS; Spring no: RN

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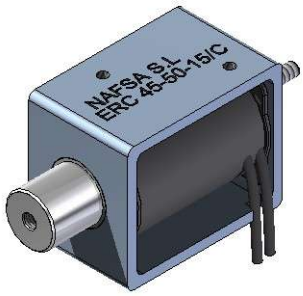
ERC 45-50-15/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 3 minutes
Standard stroke "s": 15 mm
Temperature rise "ΔV_{31}": 70ºC
Work: Push / pull
Incorporated return spring: YES



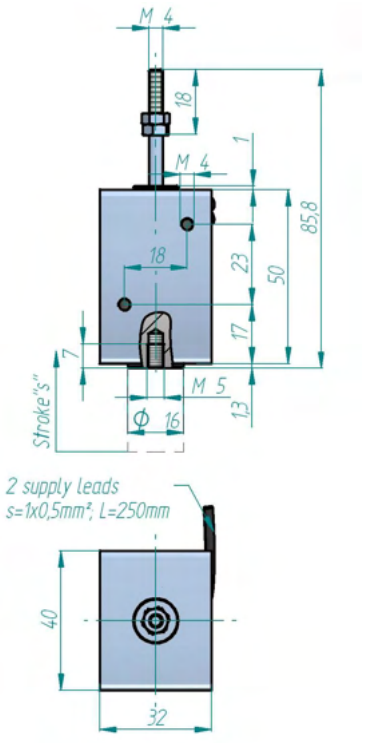
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	12	29	46	77	228
Minimum force (N)	4.5	9.3	12	16	32
Max time under voltage(s)	∞	60	38	23	8
Plunger weight (g)			52		
Solenoid weight (g)			297		

Duty-cycle ED%	Standard voltages									Under demand voltages			
	VDC							VAC		VDC		VAC	
	6	12	24	48	100	125	205	110	230	Min	Max	Min	Max
100%	o	o	o	o	o	o	o	o	o	6	230	30	230
40%	x	o	o	o	o	o	o	o	o	8	230	76	230
25%	x	o	o	o	o	o	o	x	o	9	230	120	230
15%	x	o	o	o	o	o	o	x	o	12	230	202	230
5%	x	x	o	o	o	o	o	x	x	20	230	x	x

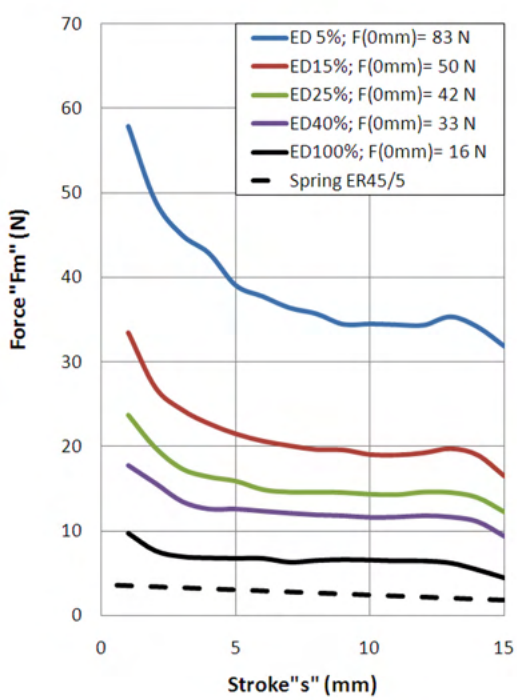
Layout: o = Available ; x = Unavailable

1)Voltage under demand:
They can be manufactured at any voltage between the maximum and minimum voltage values shown in the chart.
2)To feed in alterning current the solenoid will have a rectifier incorporated in the coil.
3)The duty cycles described in the chart are standard, they can be manufactured in any intermediate cycle.
4)If any variation from the original is needed, please ask us.
5)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 31

Ordering code: *ERC45-50-15/C --V ED---%* - Spring

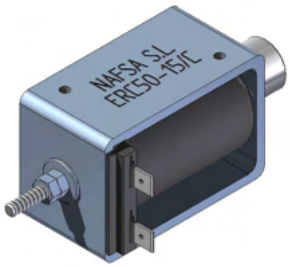
Example: Standard voltage:24Vdc; Duty cycle: ED100%; With spring : *ERC45-50-15/C 24Vdc ED100% RS*
Standard voltage:48Vdc; Duty cycle: ED15%; Without spring : *ERC45-50-15/C 48Vdc ED15% RN*

For fixation of the solenoid: see page 31

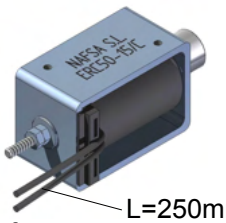
Spring yes: RS; Spring no: RN

ERC 50-15/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 3 minutes
Standard stroke "s": 15 mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: YES



Product with leads:



L=250mm
Reference:
ERC50-15/CC--V ED--%

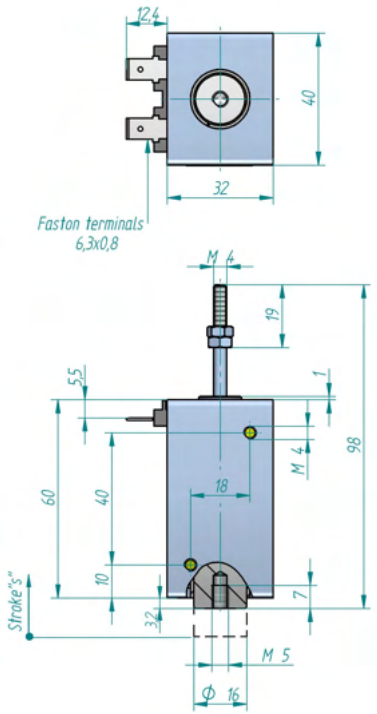
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	14	35	56	93	280
Minimum force (N)	6.8	12.8	17	23	43
Max time under voltage(s)	∞	60	38	23	8
Plunger weight (g)	70				
Solenoid weight (g)	335				

Duty-cycle ED%	Standard voltages									Under demand voltages			
	VDC							VAC		VDC		VAC	
	6	12	24	48	100	125	205	110	230	Min	Max	Min	Max
100%	o	o	o	o	o	o	o	o	o	6	230	41	230
40%	x	o	o	o	o	o	o	o	o	9	230	100	230
25%	x	o	o	o	o	o	o	x	o	11	230	160	230
15%	x	x	o	o	o	o	o	x	o	15	230	230	230
5%	x	x	o	o	o	o	o	x	x	24	230	x	x

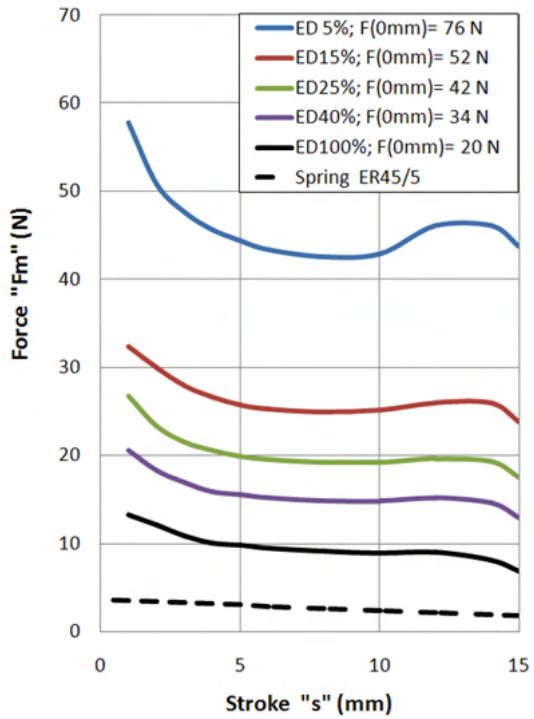
Layout: o = Available ; x = Unavailable

1)Voltage under demand:
They can be manufactured at any voltage between the maximum and minimum voltage values shown in the chart.
2)To feed in alterning current the solenoid will have a rectifier incorporated in the coil.
3)The duty cycles described in the chart are standard, they can be manufactured in any intermediate cycle.
4)If any variation from the original is needed, please ask us.
5)The terminals can be changed by leads.
6)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 31

Ordering code: *ERC50-15/C --V ED---%* - Spring

Example: Standard voltage:24Vdc; Duty cycle: ED100%; With spring : *ERC50-15/C 24Vdc ED100% RS*
Standard voltage:48Vdc; Duty cycle: ED15%; Without spring : *ERC50-15/C 48Vdc ED15% RN*

For fixation of the solenoid: see page 31

Spring yes: RS; Spring no: RN

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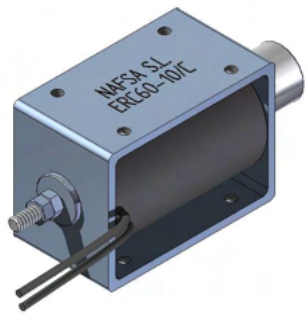
ERC 60-10/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 5 minutes
Standard stroke "s": 10 mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: YES



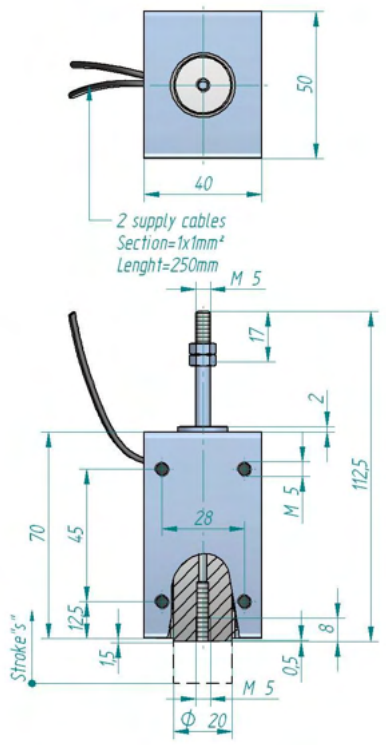
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	18	45	70	110	280
Minimum force (N)	19	33	43	56	94
Max time under voltage(s)	∞	120	75	45	15
Plunger weight (g)	120				
Solenoid weight (g)	660				

Duty-cycle ED%	Standard voltages VDC							Standard voltages VAC		Under demand voltages VDC		Under demand voltages VAC	
	6	12	24	48	100	125	205	110	230	Min	Max	Min	Max
100%	x	o	o	o	o	o	o	o	o	7	230	48	230
40%	x	o	o	o	o	o	o	x	o	11	230	125	230
25%	x	x	o	o	o	o	o	x	o	13	230	200	230
15%	x	x	o	o	o	o	o	x	x	16	230	x	x
5%	x	x	o	o	o	o	o	x	x	24	230	x	x

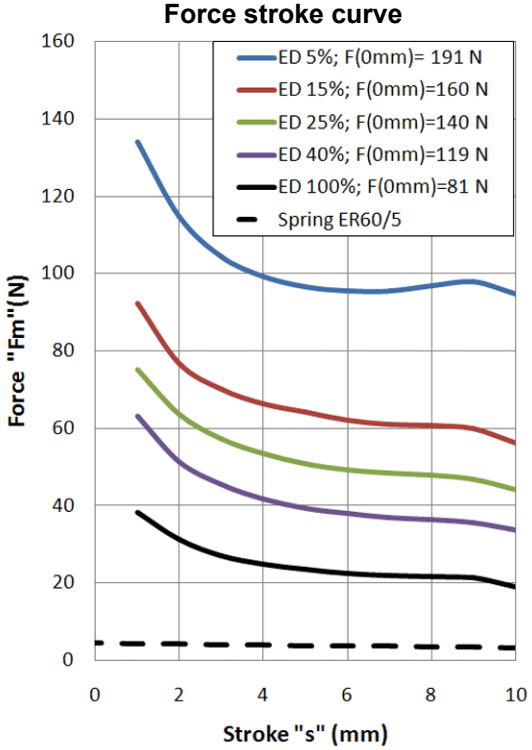
Layout: o = Available ; x = Unavailable

1)Voltage under demand:
They can be manufactured at any voltage between the maximum and minimum voltage values shown in the chart.
2)To feed in alterning current the solenoid will have a rectifier incorporated in the coil.
3)The duty cycles described in the chart are standard, they can be manufactured in any intermediate cycle.
4)If any variation from the original is needed, please ask us.
5)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 31

Ordering code: *ERC60-10/C --V ED---%* - Spring

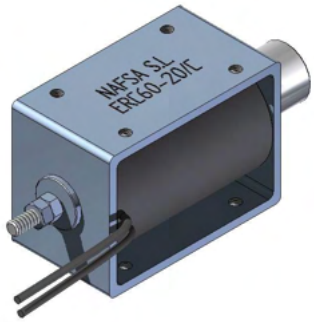
Example: Standard voltage:24Vdc; Duty cycle: ED100%: With spring : *ERC60-10/C 24Vdc ED100% RS*
Standard voltage:48Vdc; Duty cycle: ED15%: Without spring : *ERC60-10/C 48Vdc ED15% RN*

For fixation of the solenoid: see page 31

Spring yes: RS; Spring no: RN

ERC 60-20/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 5 minutes
Standard stroke "s": 20 mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: YES



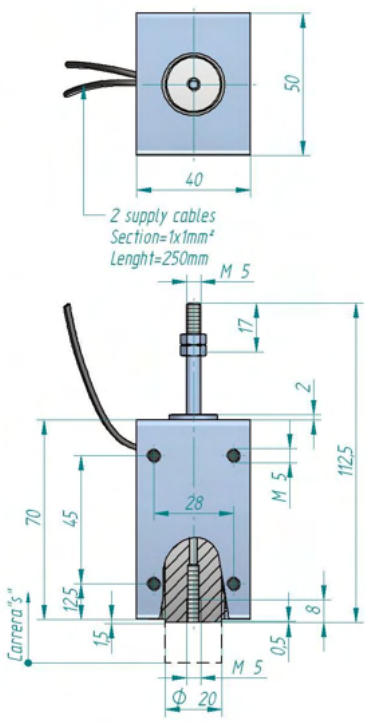
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	18	45	70	110	280
Minimum force (N)	11	19	24	32	57
Max time under voltage(s)	∞	120	75	45	15
Plunger weight (g)	110				
Solenoid weight (g)	660				

Duty-cycle ED%	Standard voltages									Under demand voltages			
	VDC							VAC		VDC		VAC	
	6	12	24	48	100	125	205	110	230	Min	Max	Min	Max
100%	x	o	o	o	o	o	o	o	o	7	230	48	230
40%	x	o	o	o	o	o	o	x	o	11	230	125	230
25%	x	x	o	o	o	o	o	x	o	13	230	200	230
15%	x	x	o	o	o	o	o	x	x	16	230	x	x
5%	x	x	o	o	o	o	o	x	x	24	230	x	x

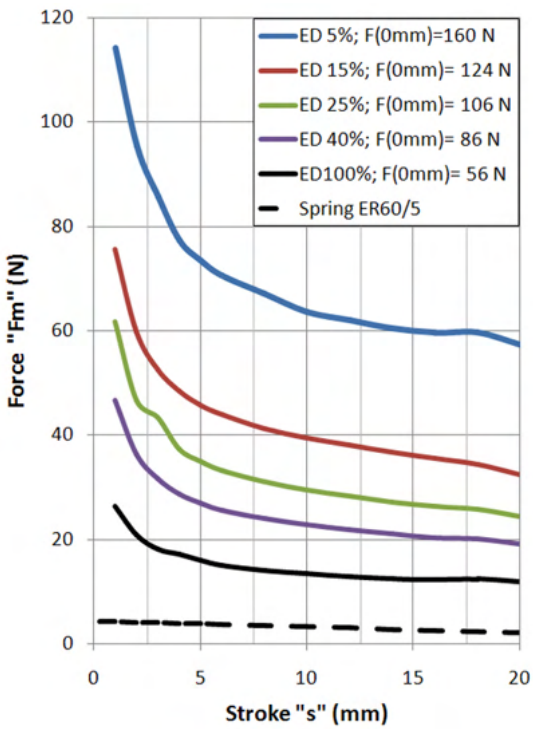
Layout: o = Available ; x = Unavailable

1)Voltage under demand:
They can be manufactured at any voltage between the maximum and minimum voltage values shown in the chart.
2)To feed in alterning current the solenoid will have a rectifier incorporated in the coil.
3)The duty cycles described in the chart are standard, they can be manufactured in any intermediate cycle.
4)If any variation from the original is needed, please ask us.
5)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 31

Ordering code: *ERC60-20/C --V ED---%* - Spring

Example: Standard voltage:24Vdc; Duty cycle: ED100%: With spring : *ERC60-20/C 24Vdc ED100% RS*
Standard voltage:48Vdc; Duty cycle: ED15%: Without spring : *ERC60-20/C 48Vdc ED15% RN*

For fixation of the solenoid: see page 31

Spring yes: RS; Spring no: RN

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