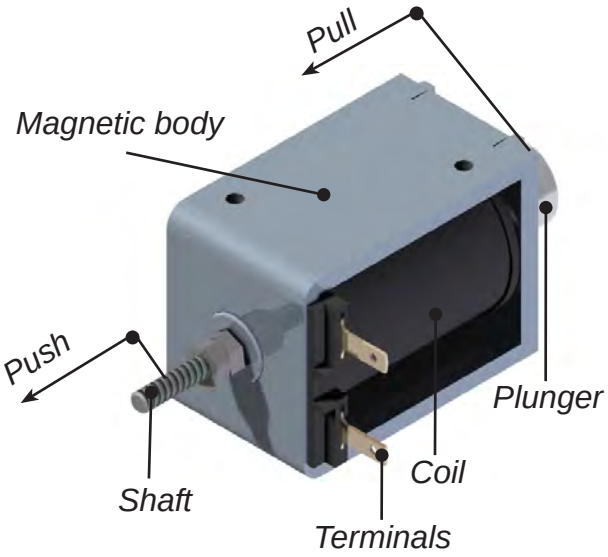
ER SERIES

ER 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.



Structure, basic elements:

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

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.

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).

-When the solenoid pulls upwards:

Effective force = Magnetic force - Plunger weight

-When the solenoid pulls downwards:

Effective force = Magnetic force + Plunger weight

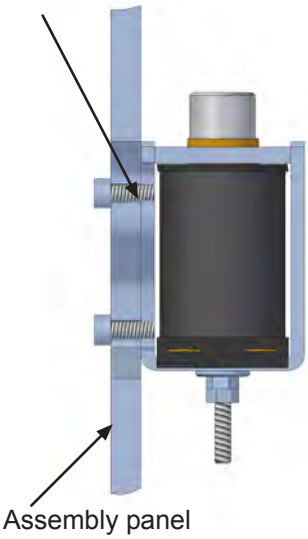
-When the solenoid pulls in horizontal position:

Effective force = Magnetic force

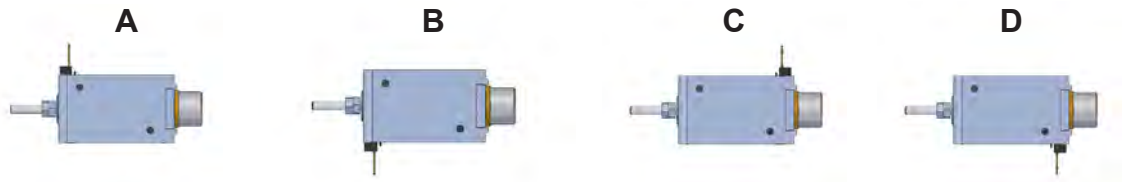
-For the units with incorporated return spring:

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



Terminals placement:



The mounting of the specification sheets is the standard one, under demand they can be mounted in the different positions shown above. It must be specified in the order. Under demand, terminals can be replaced by flying leads.

Chart: force-stroke

Type	Stroke (mm)	Duty- cycle					Return Sprinf force (N)
		100%	40%	25%	15%	5%	
ER15/C	Beginning of stroke s_1=5	0.3	0.5	0.8	1	2.5	
	End of stroke s_0=0	4.9	7.9	9.8	12.2	16.5	
ER20/C	Beginning of stroke s_1=5	0.8	2.1	2.8	4.1	6.8	0.25
	End of stroke s_0=0	2.6	4.9	6.2	7.7	11.2	0.44
ER21/C	Beginning of stroke s_1=10	1.3	2.3	3.1	4.1	6.2	0.2
	End of stroke s_0=0	1.8	2.9	3.8	5	7.4	0.4
ER25/C	Beginning of stroke s_1=5	2.5	5.4	7.5	10	17	0.29
	End of stroke s_0=0	7.1	17.3	21.3	24.4	31.9	0.65
ER30/C	Beginning of stroke s_1=8	2.9	5.6	7.8	11.4	19.7	0.59
	End of stroke s_0=0	7.7	12	13.8	21.5	35	1.57
ER30/CT	Beginning of stroke s_1=8	2.8	5.5	7.7	11.3	19.6	0.59
	End of stroke s_0=0	7.6	11.9	13.7	21.4	34.9	1.57
ER35/C	Beginning of stroke s_1=12	1.5	4,3	7.5	10.6	17.3	0.39
	End of strokes s_0=0	4.5	10.9	14.7	16.6	31	1.57
ER40/CT	Beginning of stroke s_1=5	2.9	6.5	13	16.5	43	
	End of stroke s_0=0	26.1	41.5	68.4	74.5	121.8	
ER45-05/C	Beginning of stroke s_1=5	0.1	6.3	10.6	14.4	35	3
	End of stroke s_0=0	59.9	113.3	160.6	192.5	234.5	3.62
ER45-15/C	Beginning of stroke s_1=15	3.3	7,3	10	15.5	27	1.76
	End of stroke s_0=0	9.3	20.8	31.9	45.3	71.3	3.62
ER48/T	Beginning of stroke s_1=8	9,1	19,5	26,7	32,5	45,1	
	End of stroke s_0=0	36,2	42,8	48,4	50,4	65,4	
ER50-15/C	Beginning of stroke s_1=15	6.7	13	16	23	37	1.76
	End of stroke s_0=0	22.5	41	52.7	67.9	99.3	3.62
ER50-15/CT	Beginning of stroke s_1=15	6.5	12.8	15.8	22.8	36.8	1.76
	End of stroke s_0=0	22.3	40.8	52.5	67.7	99.1	3.62
ER60-05/C	Beginning of stroke s_1=5	7	18	28	47	96	3.76
	End of stroke s_0=0	155	192	296	346	382	4.3
ER60-10/C	Beginning of stroke s_1=10	12	24	32	44	80	3.21
	End of stroke s_0=0	55.6	95.5	121.7	152.5	200.8	4.3
ER60-10/CT	Beginning of stroke s_1=10	11.6	23.6	31.6	43.6	79.6	3.21
	End of stroke s_0=0	55.1	95.1	121.3	152.1	200.4	4.3
ER60-20/C	Beginning of stroke s_1=20	9.2	16.7	21.5	28.5	50	2.12
	End of stroke s_0=0	27.2	60.5	87.7	103.6	150.2	4.3

Magnetic force "Fm" (N)

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

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CUSTOMIZATION: ER SERIE

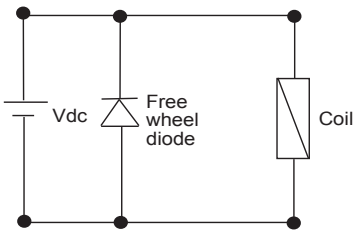
The models described in the catalogue are standard and minimum manufacturing batches are not required. However, there is the possibility of customizing them to suit better customer's needs. See below some of the most common customizations.
If any modification is needed, please ask NAFSA about the possibility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

1. ELECTRICAL CUSTOMIZATION:

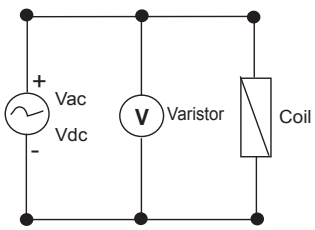
a) Integrated electronics over the coil:

a.1)For peak supression
Examples:

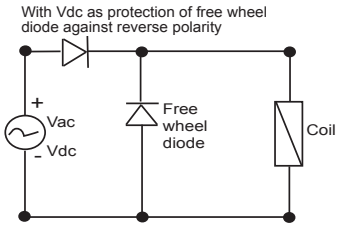
*Free wheel diode



*Varistor

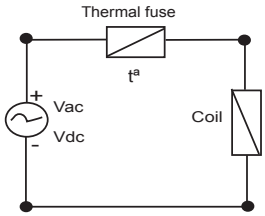


*Free wheel diode+second diode to protect the free wheel diode against reverse polarity



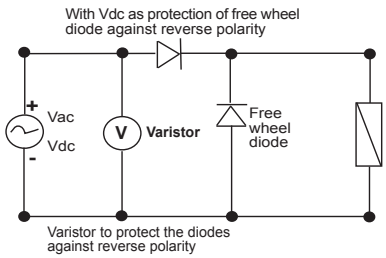
a.2) Thermal protection
Examples:

*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: **ER30CCREC**

***PWD over the cables**

Example 2:

Example 3: **ER20CCF**

Example 4: **ER20-07.01**.

b) Cable length modification and terminal or connector mounted over cables:
In all ER 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 tha 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:

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

CUSTOMIZATION:ER 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.

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.

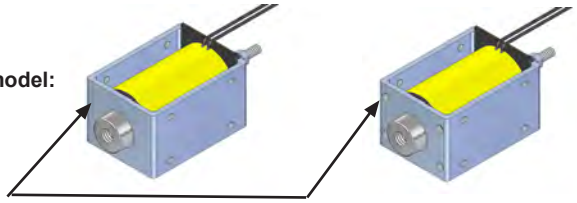
a) Flat | b) Spherical | c) Threaded | d) Transverse hole | e) Grooved | f) Threaded hole

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:



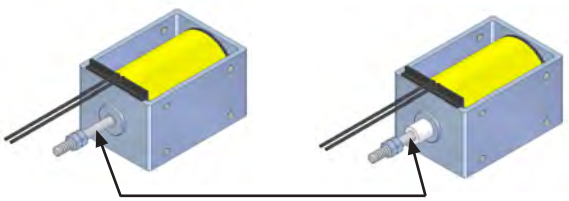
Customized model with extra holes:

4.4) Return spring force modification:
ER 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.

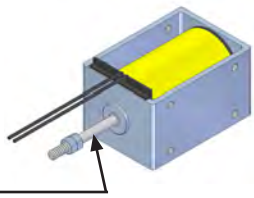
In the cases that spring is not required, solenoid can be ordered without spring or it can be removed manually.

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

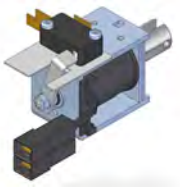


Example:
Stroke increase:
Shaft has been enlarged to increase the stroke, This modifcation only can be made by NAFSA.



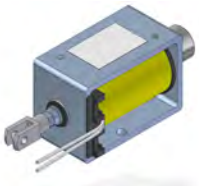
4.6) Position detection system integration:

Example:
ER45-10/BT1



4.7) Fastening element added as Fork joints DIN71752:

Example:
ER45-10/E



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

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ER15/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle-duration: 2minutes
Standard stroke "s": 5mm
Temperature rise "ΔV_{31} ": 70ºC
Work: pull / push
Incorporated return spring: NO

Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	3	7.5	12	20	60
Minimum force (N)	0.3	0.5	0.8	1	2.5
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)			11		
Solenoid weight (g)			39		

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	x	x	x	x	x	3	55	x	x
40%	o	o	o	o	x	x	x	x	x	3	85	x	x
25%	o	o	o	o	o	x	x	x	x	3	105	x	x
15%	o	o	o	o	o	o	x	x	x	6	135	x	x
5%	o	o	o	o	o	o	o	x	x	6	230	x	x

Layout: o = Available ; x = Unavailable

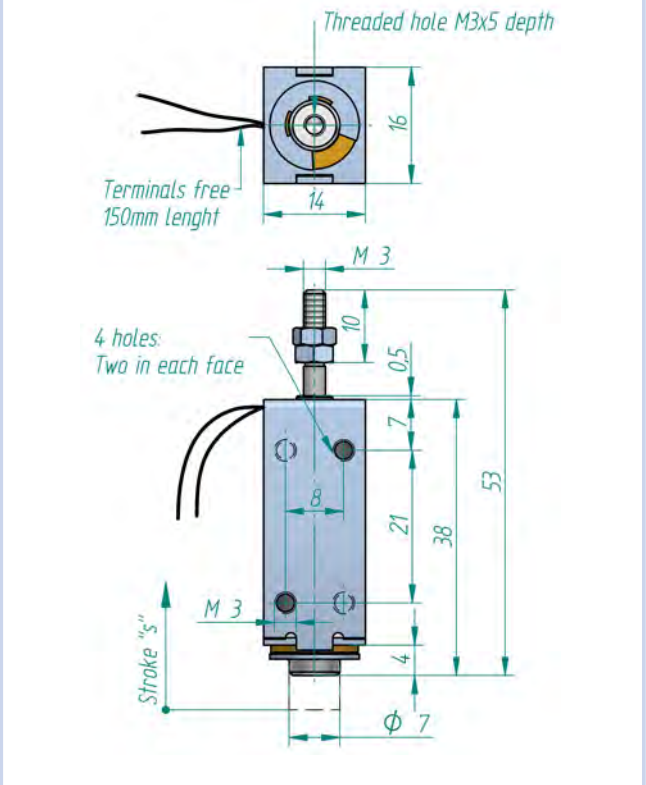
1)Voltage under demand:
They can be manufactured at any voltage between the maximum and minimum voltage shown in the chart.

2)The duty-cycles described in the chart are standard, they can be manufactured in any intermediate cycle.

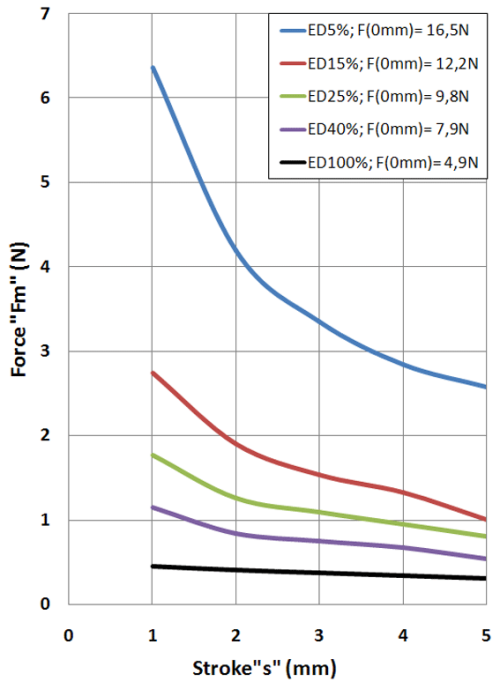
3)If any variation from the original is needed, please ask us.

4)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force-stroke curve



Calculation of the effective force: see pages 1 and 10

Ordering code: *ER15/C --V ED---%* - Mounting position

Example: Standard voltage:24Vdc Duty-cycle: ED100%: Position when mounted A: *ER15/C 24Vdc ED100% A*
Standard voltage:12Vdc Duty-cycle: ED15%: Position when mounted C: *ER15/C 12Vdc ED15% C*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

ER20/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 2 minutes
Standard stroke "s": 5mm
Temperature rise "ΔV_{31}": 70ºC
Work: Pull/Push
Incorporated return spring: YES

Product with lead:

Reference:
ER20/CC--V ED--%

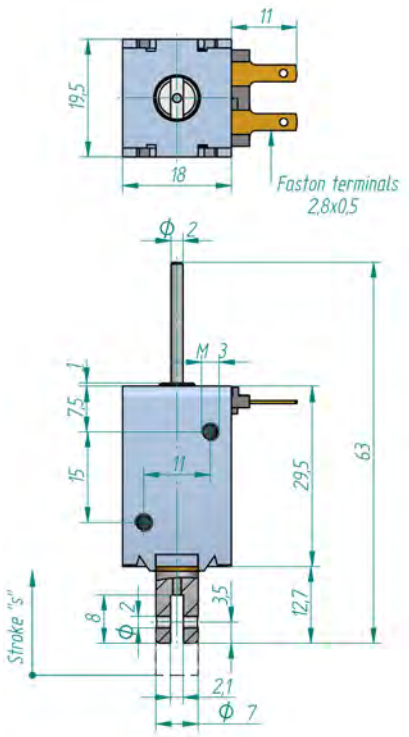
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	5.5	11	16	24	60
Minimum force (N)	0.8	2.1	2.8	4.1	6.8
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)	12				
Solenoid weight (g)	45				

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%	o	o	o	o	x	x	x	x	x	3	85	x	x
40%	o	o	o	o	o	o	x	x	x	3	125	x	x
25%	o	o	o	o	o	o	x	x	x	3	150	x	x
15%	o	o	o	o	o	o	x	x	x	4	180	x	x
5%	o	o	o	o	o	o	o	x	x	6	230	x	x

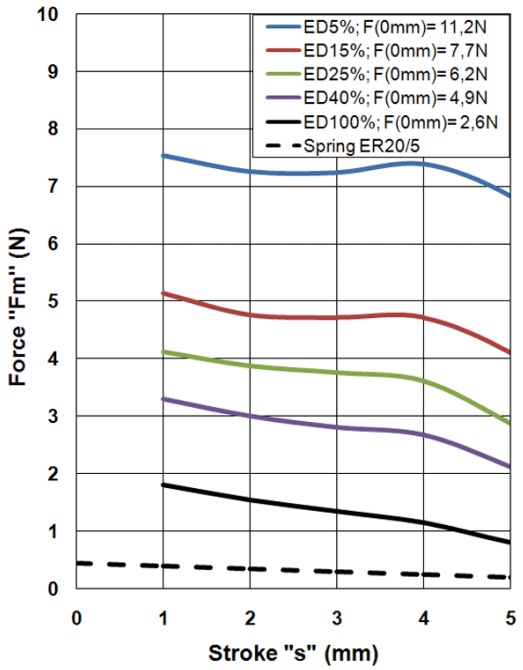
Layout: o = Available ; x = Unavailable

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 10

Ordering code: *ER20/C --V ED---%* - Position when mounted - Spring

Example: Standard voltage:24Vdc Duty-cycle: ED100%: Position when mounted A: With spring : *ER20/C 24Vdc ED100% A RS*
Standard voltage:12Vdc Duty-cycle: ED15%: Position when mounted C: Without spring : *ER20/C 12Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER21/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 2 minutes
Standard stroke "s": 10mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: YES

Product with leads:

Reference:
ER21/CC--V ED--%

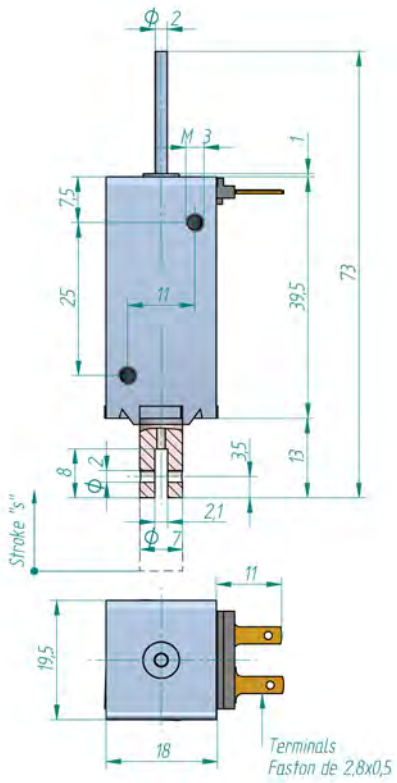
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	6	14	24	35	100
Minimum force (N)	1.3	2.3	3.1	4.1	6.2
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)			12		
Solenoid weight (g)			62		

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%	o	o	o	o	o	x	x	x	x	3	110	x	x
40%	o	o	o	o	o	o	x	x	x	4	165	x	x
25%	o	o	o	o	o	o	o	x	x	5	220	x	x
15%	o	o	o	o	o	o	o	x	x	6	230	x	x
5%	x	o	o	o	o	o	o	x	x	9	230	x	x

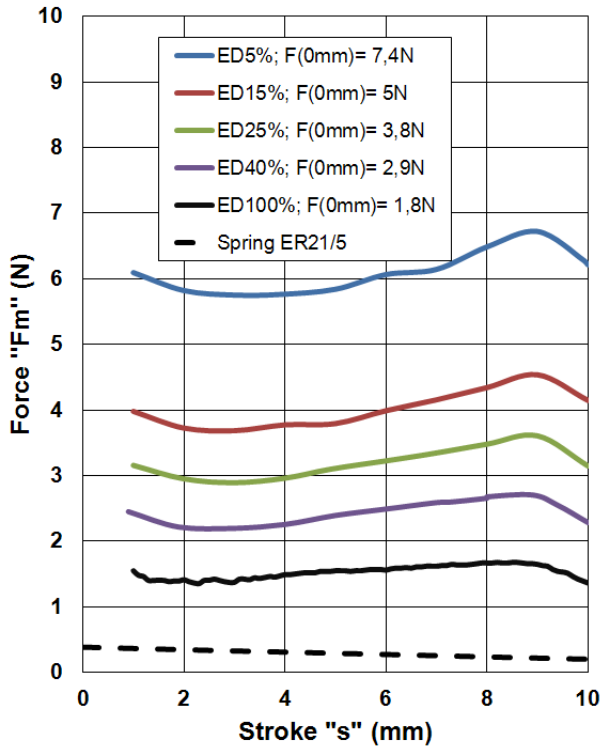
Layout: o = Available ; x = Unavailable

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)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 10

Ordering code: *ER21 /C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER21/C 24Vdc ED100% A RS*
Standard voltage:12Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER21/C 12Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER25/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 2 minutes
Standard stroke "s": 5mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: YES

Product with leads:

Reference:
ER25/CC--V ED--%

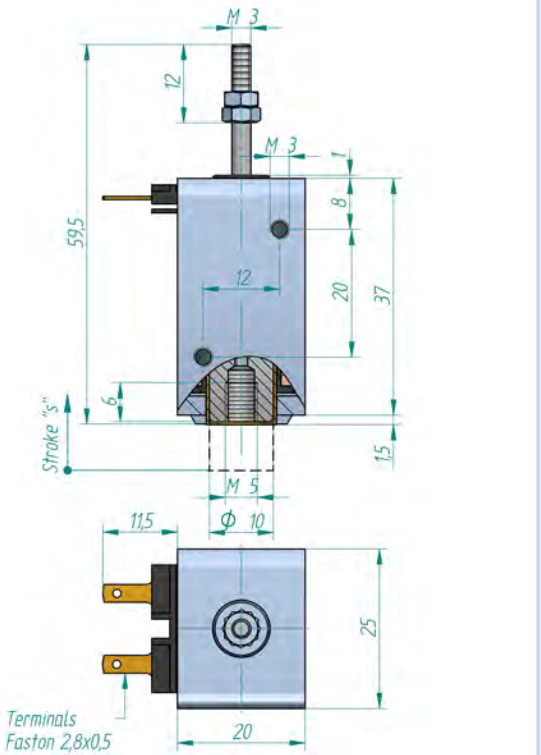
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	7.5	17	25	38	95
Minimum force (N)	2.5	5.4	7.5	10	17
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)			15		
Solenoid weight (g)			85		

Duty-cycle ED%	Standard voltages VDC							VAC		Under demand voltages VDC		VAC	
	6	12	24	48	100	125	205	110	230	Min	Max	Min	Max
100%	o	o	o	o	o	o	x	x	x	3	140	x	x
40%	o	o	o	o	o	o	o	x	x	5	220	x	x
25%	o	o	o	o	o	o	o	x	x	5	230	x	x
15%	o	o	o	o	o	o	o	x	x	6	230	x	x
5%	x	o	o	o	o	o	o	x	x	9	230	x	x

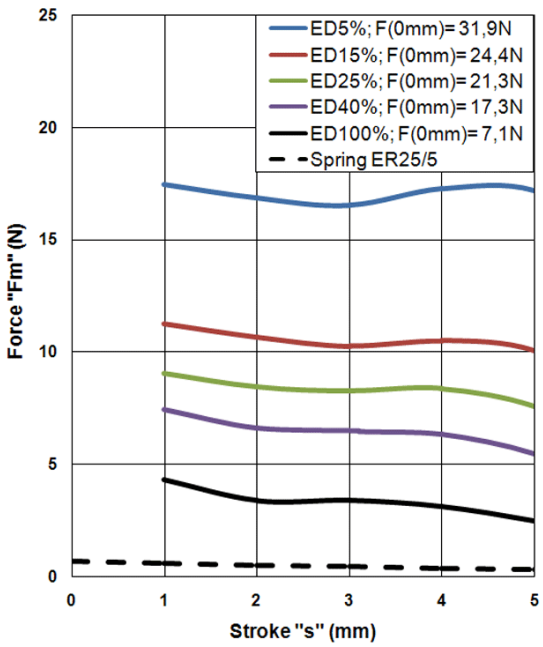
Layout: o = Available ; x = Unavailable

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)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 10

Ordering code: *ER 25/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER25/C 24Vdc ED100% A RS*
Standard voltage:12Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER25/C 12Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER30/C TYPE

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

Product with leads:

Reference:
ER30/CC--V ED--%

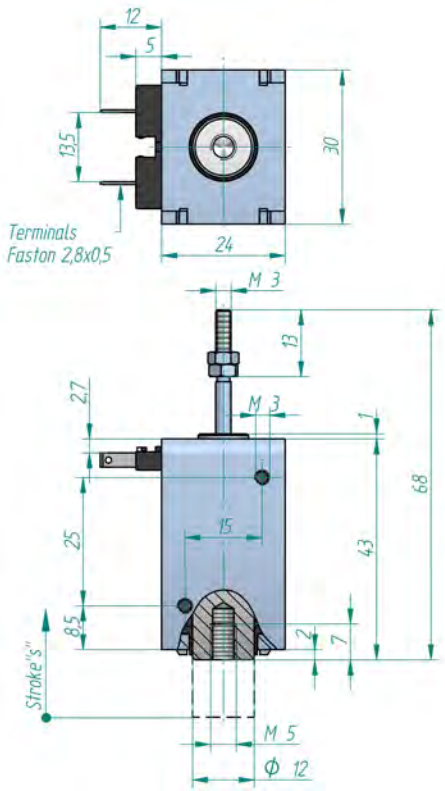
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	8	20	30	50	120
Minimum force (N)	2.9	5.6	7.8	11.4	19.7
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)	25				
Solenoid weight (g)	140				

Duty-cycle ED%	Standard voltages VDC							VAC		Under demand voltages 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

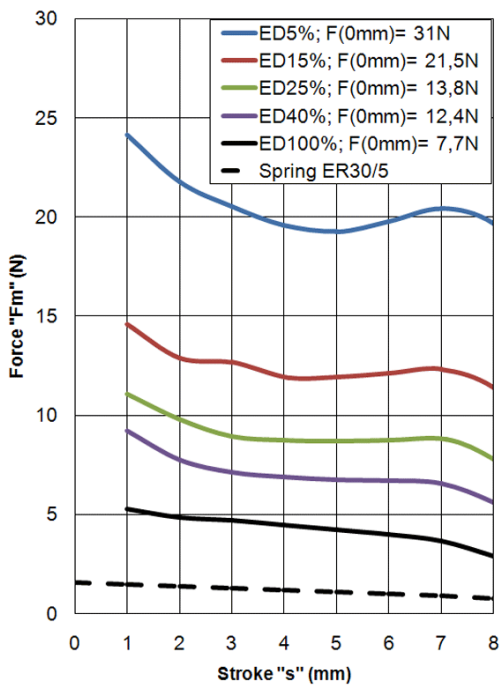
Layout: o = Available ; x = Unavailable

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 1and 10

Ordering code: *ER30/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER30/C 24Vdc ED100% A RS*
Standard voltage:12Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER30/C 12Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER30/CT TYPE

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

Product with leads:

Reference:
ER30/CTC--V ED--%

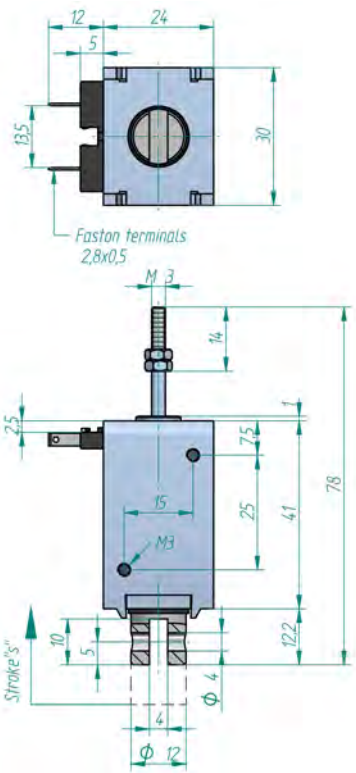
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	8	20	30	50	120
Minimum force (N)	2.8	5.5	7.7	11.3	19.6
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)	32				
Solenoid weight (g)	147				

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%	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

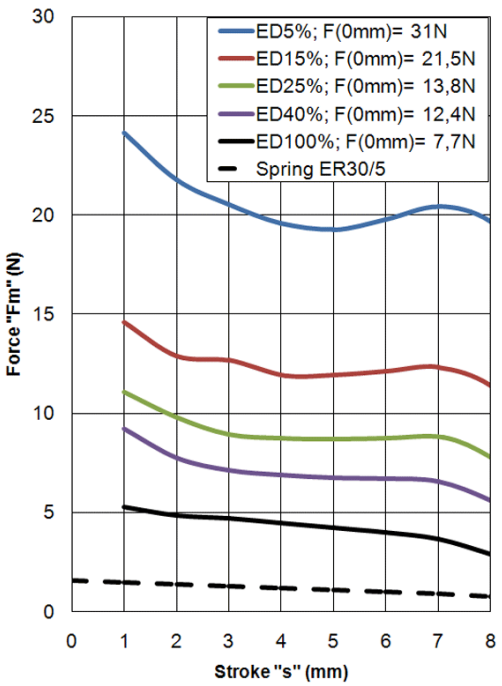
Layout: o = Available ; x = Unavailable

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 pages1 and 10

Ordering code: *ER30/CT --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER30/CT 24Vdc ED100% A RS*
Standard voltage:12Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER30/CT 12Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER35/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:
ER35/CC--V ED--%

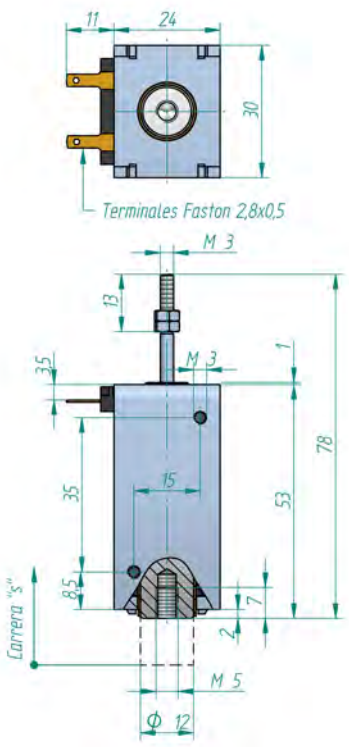
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	9	20	35	60	150
Minimum force (N)	1.5	4.3	7.5	10.6	17.3
Max time under voltage(s)	∞	48	30	18	6
Plunger weight (g)			34		
Solenoid weight (g)			170		

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%	o	o	o	o	o	o	o	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

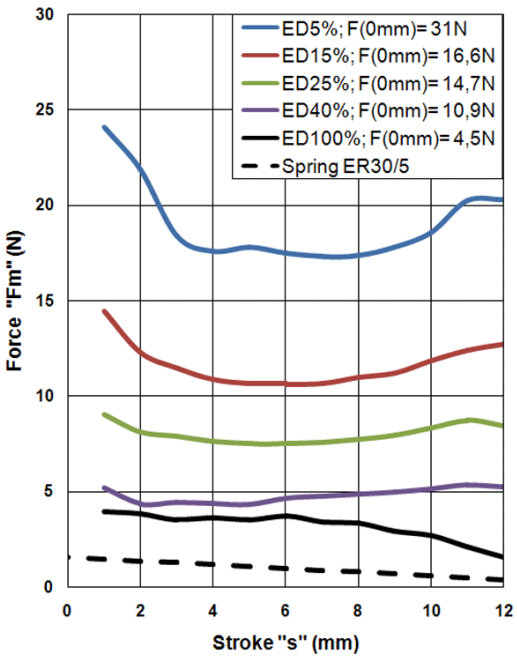
Layout: o = Available ; x = Unavailablee

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 10

Ordering code: *ER35/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER35/C 24Vdc ED100% A RS*
Standard voltage:12Vdc Duty cycle: ED15%: Mounting position B: Without spring : *ER35/C 12Vdc ED15% B RN*

For fixation and positions (A,B) of the solenoid: see page 10 ; Spring yes: RS; Spring no: RN

ER 40/CT TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 3 minutes
Standard stroke "s": 15 mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull
Incorporated return spring: NO

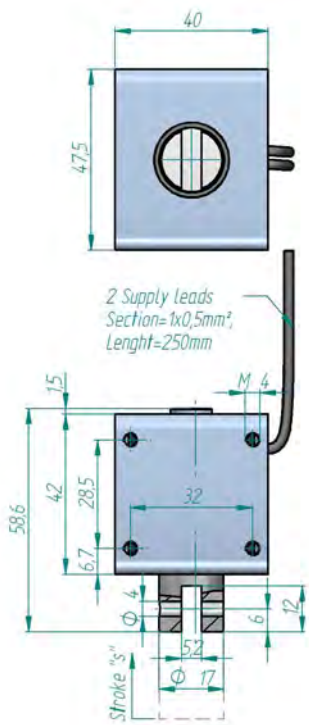
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	13	27	44	76	218
Minimum force (N)	2.9	6.5	1 3	16.5	43
Max time under voltage(s)	∞	60	38	23	8
Plunger weight (g)	65				
Solenoid weight (g)	368				

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	31	230
40%	x	o	o	o	o	o	o	o	o	8	230	64	230
25%	x	o	o	o	o	o	o	o	o	9	230	104	230
15%	x	o	o	o	o	o	o	x	o	11	230	180	230
5%	x	x	o	o	o	o	o	x	x	24	230	x	x

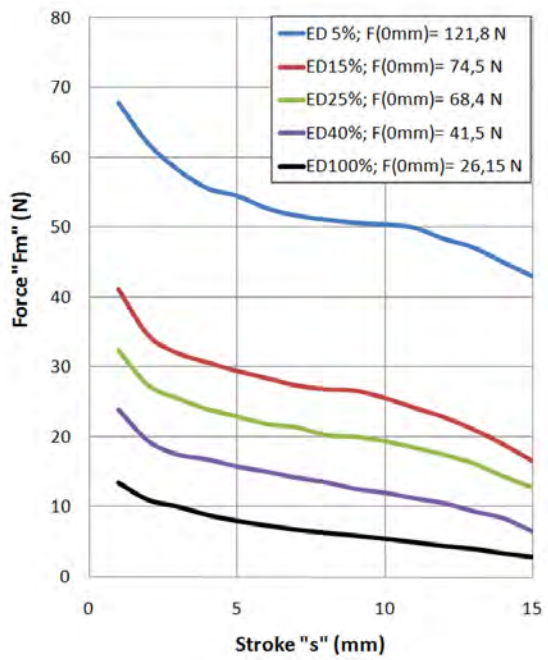
Layout: o = Available ; x = Unavailable

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)Earthing is recommended if the metallic parts are accessible.

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 10

Ordering code: *ER40/CT --V ED---%*

Example: Standard voltage:24Vdc; Duty cycle: ED100%: *ER40/CT 24Vdc ED100%*
Standard voltage:48Vdc; Duty cycle: ED15%: *ER40/CT 48Vdc ED15%*

ER45-05/C TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 3 minutes
Standard stroke "s": 5mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull/push
Incorporated return spring: YES

Product with leads:

Reference:
ER45-05/CC--V ED--%

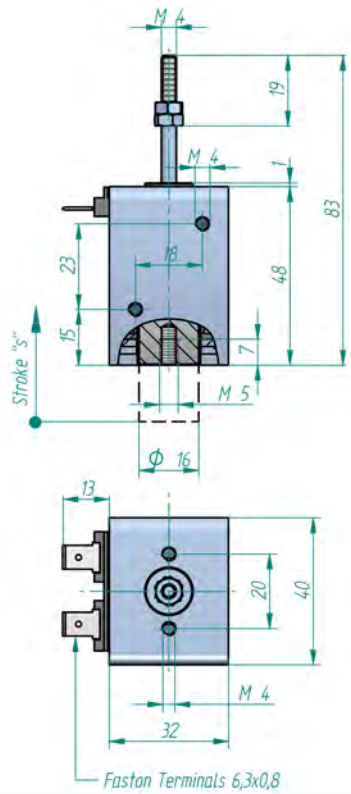
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	12	30	48	80	240
Minimum force (N)	0.1	6.3	10.6	14.4	35
Max time under voltage(s)	∞	60	38	23	8
Plunger weight (g)	59				
Solenoid weight (g)	285				

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%	o	o	o	o	o	o	o	o	o	5	230	34	230
40%	x	o	o	o	o	o	o	o	o	7	230	86	230
25%	x	o	o	o	o	o	o	x	o	9	230	136	230
15%	x	o	o	o	o	o	o	x	o	11	230	230	230
5%	x	x	o	o	o	o	o	x	x	16	230	x	x

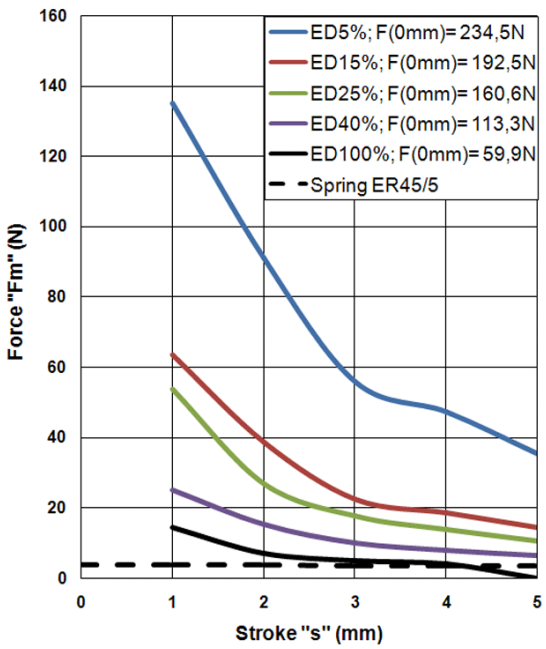
Layout: o = Available ; x = Unavailable

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 10

Ordering code: *ER45-05/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER45-05/C 24Vdc ED100% A RS*
Standard voltage:12Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER45-05/C 12Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER45-15/C TYPE

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

Product with leads:

Reference:
ER45-15/CC--V ED--%

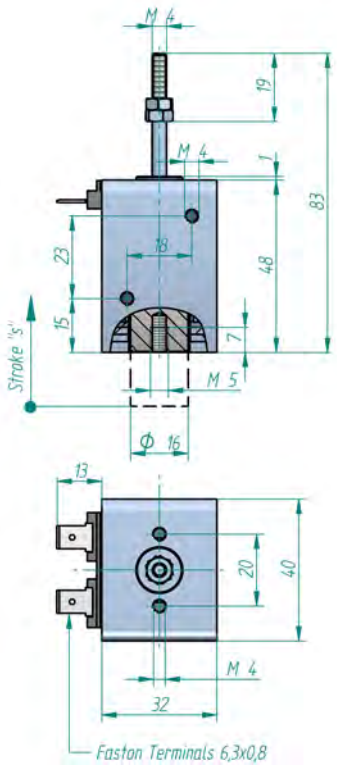
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	12	30	48	80	240
Minimum force (N)	3.3	7.3	10	15.5	27
Max time under voltage(s)	∞	60	38	23	8
Plunger weight (g)			59		
Solenoid weight (g)			285		

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	5	230	34	230
40%	x	o	o	o	o	o	o	o	o	7	230	86	230
25%	x	o	o	o	o	o	o	x	o	9	230	136	230
15%	x	o	o	o	o	o	o	x	o	11	230	230	230
5%	x	x	o	o	o	o	o	x	x	16	230	x	x

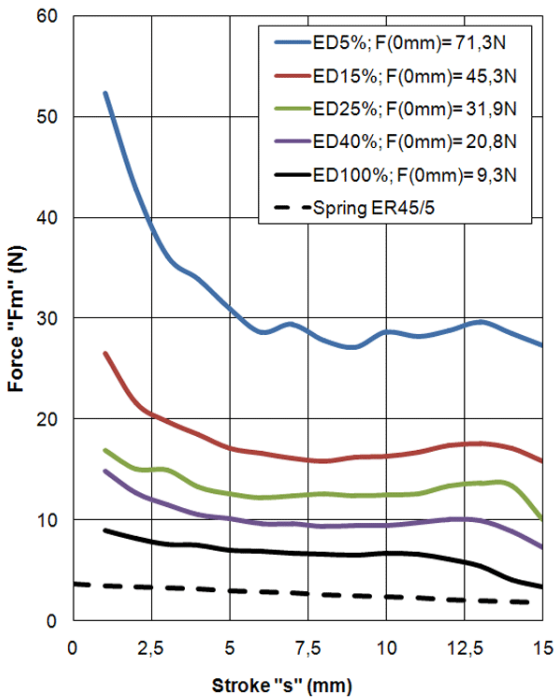
Layout: o = Available ; x = Unavailable

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 10

Ordering code: *ER45-15/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER45-15/C 24Vdc ED100% A RS*
Standard voltage:12Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER45-15/C 12Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER48/T TYPE

Protection rate: IP00
Insulation class: B (130ºC)
Cycle duration: 3 minutes
Standard stroke "s": 8mm
Temperature rise "ΔV_{31}": 70ºC
Work: pull
Incorporated return spring: NO

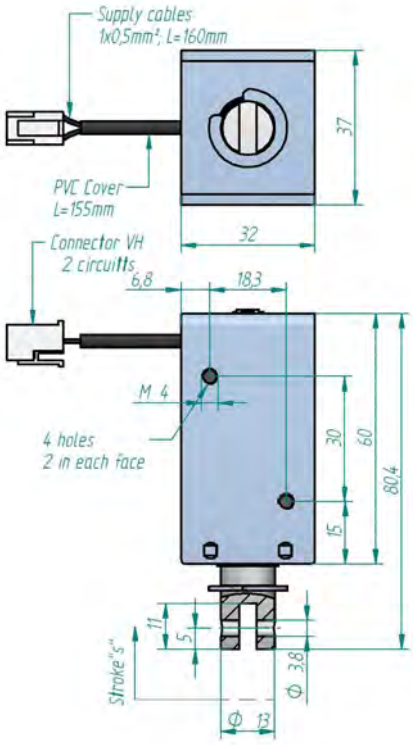
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	15	35	54	89	271
Minimum force (N)	9.1	19.5	26.7	32.5	45,1
Max time under voltage(s)	∞	60	38	23	8
Plunger weight (g)	66				
Solenoid weight (g)	292				

Duty-cycle ED%	Standard voltages VDC							VAC		Under demand voltages 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	5	230	34	230
40%	x	o	o	o	o	o	o	o	o	7	230	86	230
25%	x	o	o	o	o	o	o	x	o	9	230	136	230
15%	x	o	o	o	o	o	o	x	o	11	230	230	230
5%	x	x	o	o	o	o	o	x	x	16	230	x	x

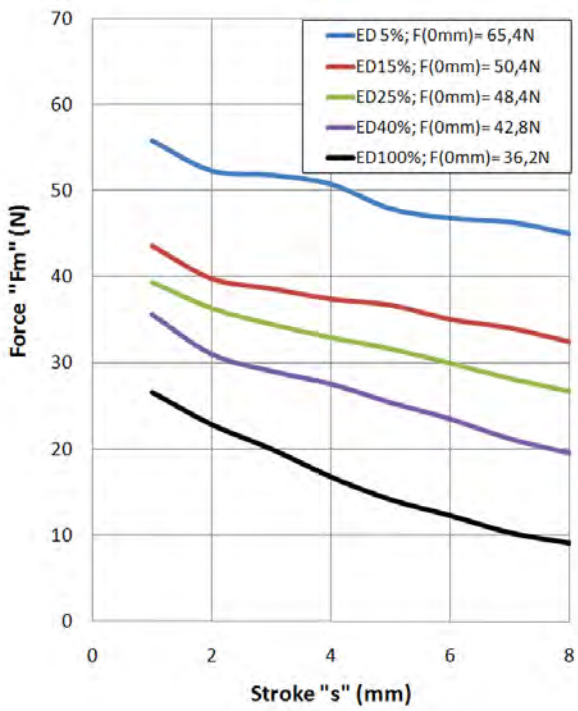
Layout: o = Available ; x =Unavailable

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 connector can be changed by leads.
6)Earthing is recommended if the metallic

Solenoid under voltage



Force stroke curve



Calculation of the effective force: see pages 1 and 10

Ordering code: *ER48/T --V ED---%* - Mounting position

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: *ER48/T 24Vdc ED100% A*
Standard voltage:12Vdc Duty cycle: ED15%: Mounting position C: *ER48/T 12Vdc ED15% C*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

ER50-15/C TYPE

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

Product with leads:

Reference:
ER50-15/CC--V ED--%

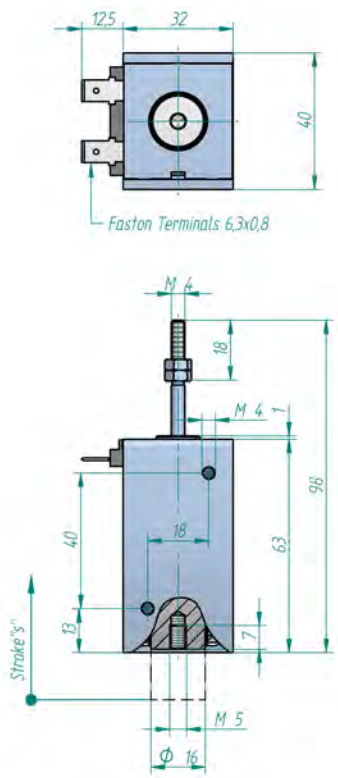
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	14	35	56	93	280
Minimum force (N)	6.7	13	16	23	37
Max time under voltage(s)	∞	60	38	23	8
Plunger weight (g)	71				
Solenoid weight (g)	365				

Duty-cycle ED%	Standard voltages VDC							VAC		Under demand voltages 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

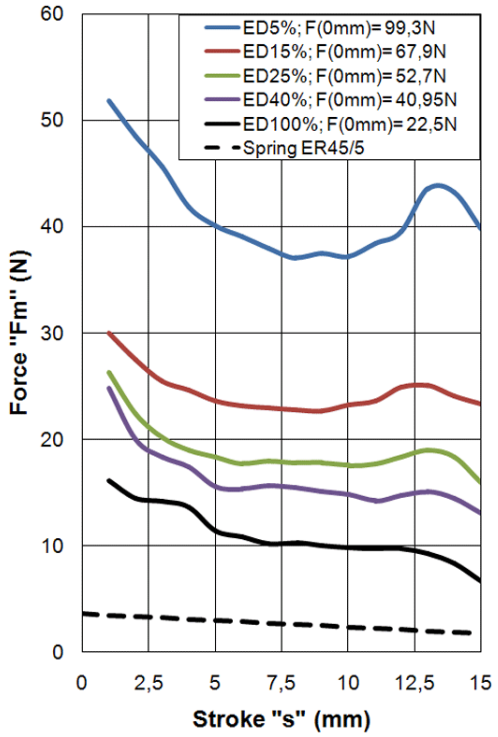
Layout: o = Available ; x = Unavailable

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 documents 1 & 10

Ordering code: *ER50-15/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER50-15/C 24Vdc ED100% A RS*
Standard voltage:48Vdc Duty cycle: ED15%: Mounting position B: Without spring : *ER50-15/C 48Vdc ED15% B RN*

For fixation and positions (A,B) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER50-15/CT TYPE

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

Product with leads:

Reference:
ER50-15/CTC--V ED--%

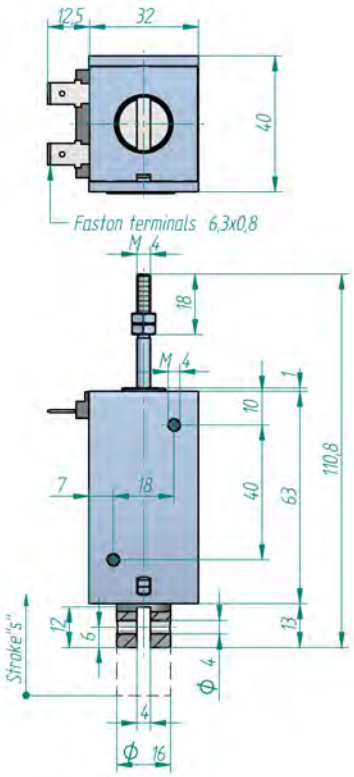
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	14	35	56	93	280
Minimum force (N)	6.7	13	16	23	37
Max time under voltage(s)	∞	60	38	23	8
Plunger weight (g)	85				
Solenoid weight (g)	380				

Duty-cycle ED%	Standard voltages VDC							VAC		Under demand voltages 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

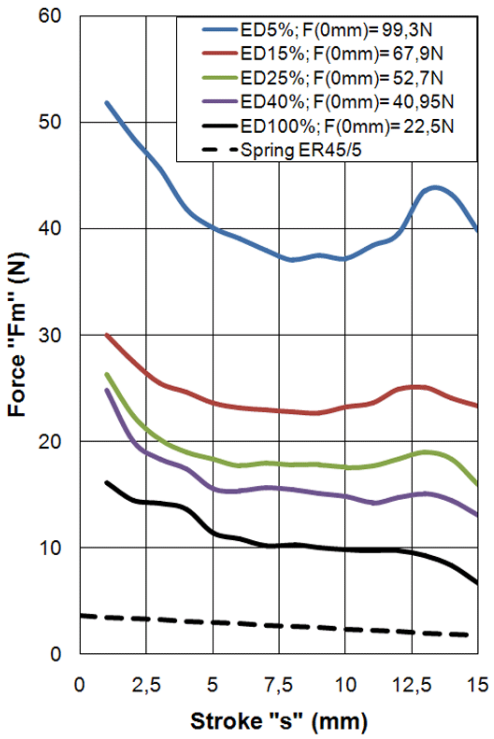
Layout: o = Available ; x = Unavailable

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 10

Ordering code: *ER50-15/CT --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER50-15/CT 24Vdc ED100% A RS*
Standard voltage:48Vdc Duty cycle: ED15%: Mounting position B: Without spring : *ER50-15/CT 48Vdc ED15% B RN*

For fixation and positions (A,B) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER60-05/C TYPE

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

Product with leads:

Reference:
ER60-05/CC--V ED--%

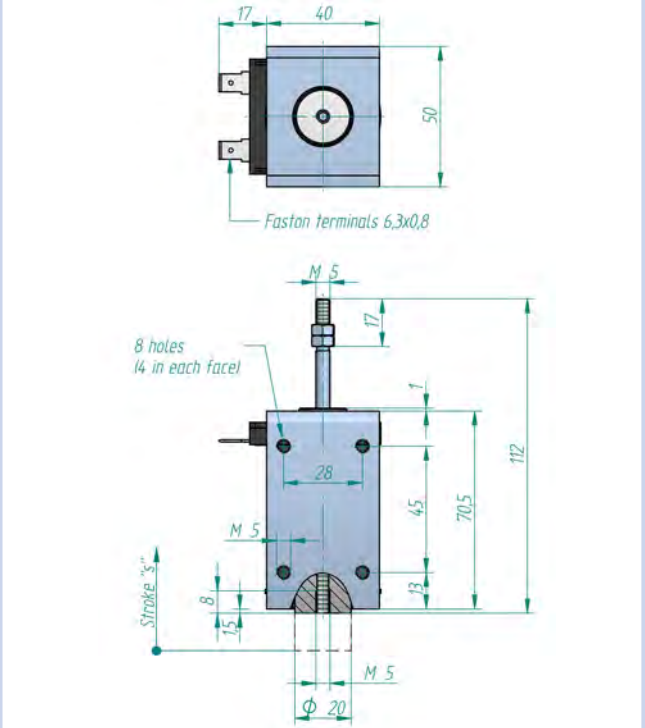
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	18	45	70	110	280
Minimum force (N)	7	18	28	47	96
Max time under voltage(s)	∞	120	75	45	15
Plunger weight (g)	117				
Solenoid weight (g)	650				

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

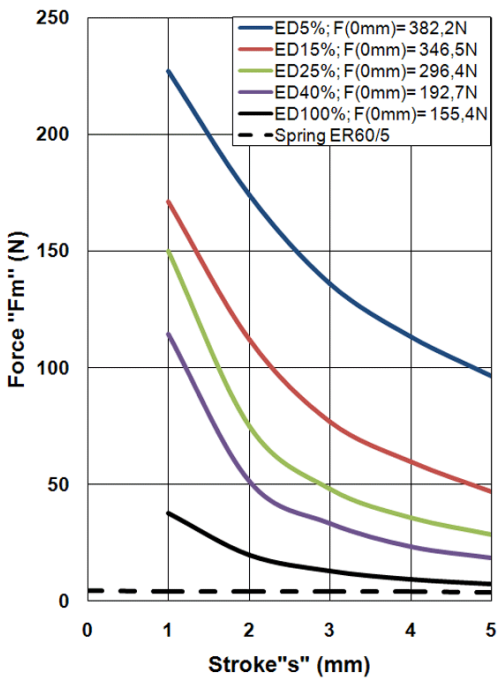
Layout: o = Available ; x = Unavailable

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)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 10

Ordering code: *ER60-05/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER60-05/C 24Vdc ED100% A RS*
Standard voltage:48Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER60-05/C 48Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER60-10/C TYPE

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

Product with leads:

Reference:
ER60-10/CC--V ED--%

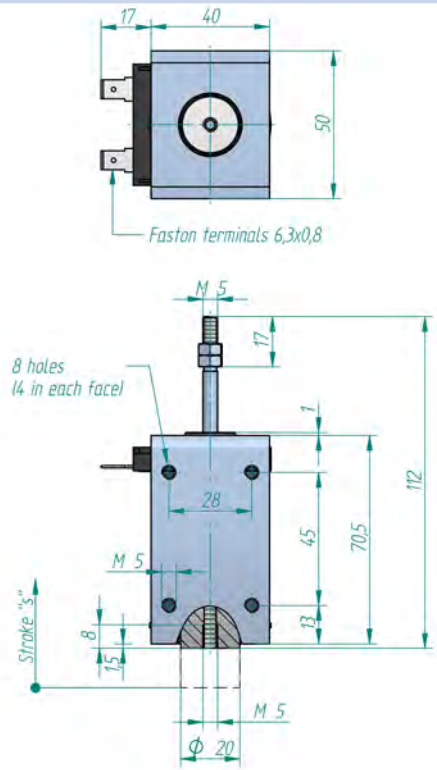
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	18	45	70	110	280
Minimum force (N)	12	24	32	44	80
Max time under voltage(s)	∞	120	75	45	15
Plunger weight (g)	117				
Solenoid weight (g)	650				

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

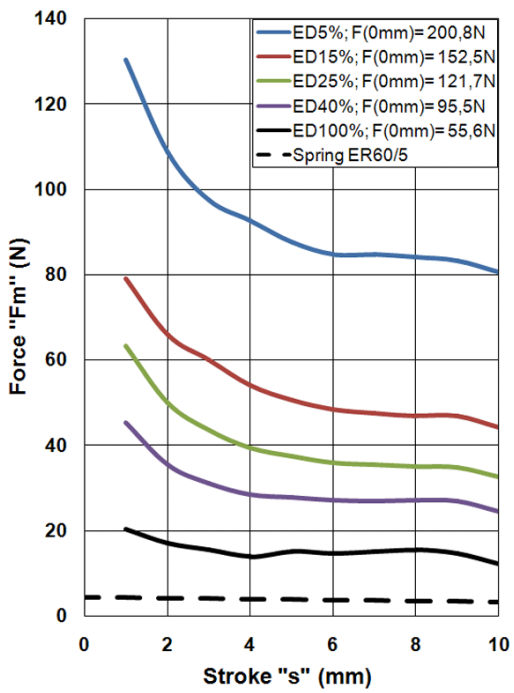
Layout: o = Available ; x = Unavailable

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)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 10

Ordering code: *ER60-10/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER60-10/C 24Vdc ED100% A RS*
Standard voltage:48Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER60-10/C 48Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER60-10/CT TYPE

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

Product with leads:

Reference:
ER60-10/CTC--V ED--%

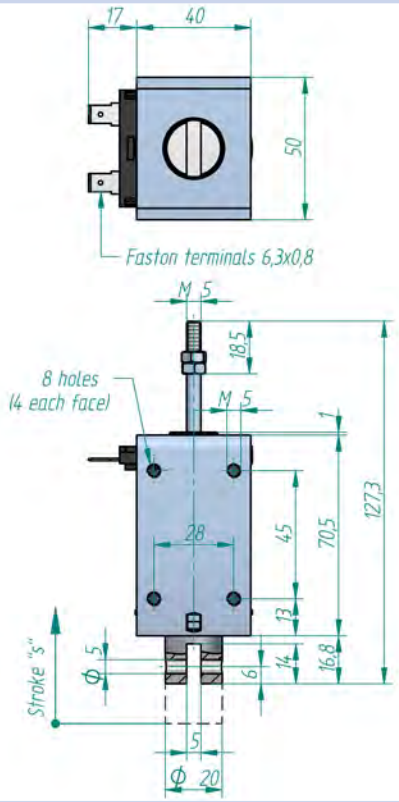
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	18	45	70	110	280
Minimum force (N)	11.6	23.6	31.6	43.6	79.6
Max time under voltage(s)	∞	120	75	45	15
Plunger weight (g)	148				
Solenoid weight (g)	681				

Duty-cycle ED%	Standard voltages VDC							VAC		Under demand voltages 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

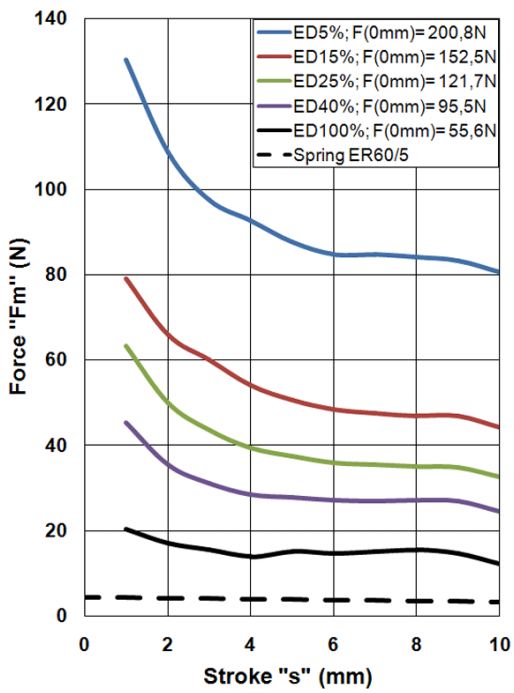
Layout: o = Available ; x = Unavailable

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)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 10

Ordering code: *ER60-10/CT --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER60-10/CT 24Vdc ED100% A RS*
Standard voltage:48Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER60-10/CT 48Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN

ER60-20/C TYPE

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

Product with leads:

Reference:
ER60-20/CC--V ED--%

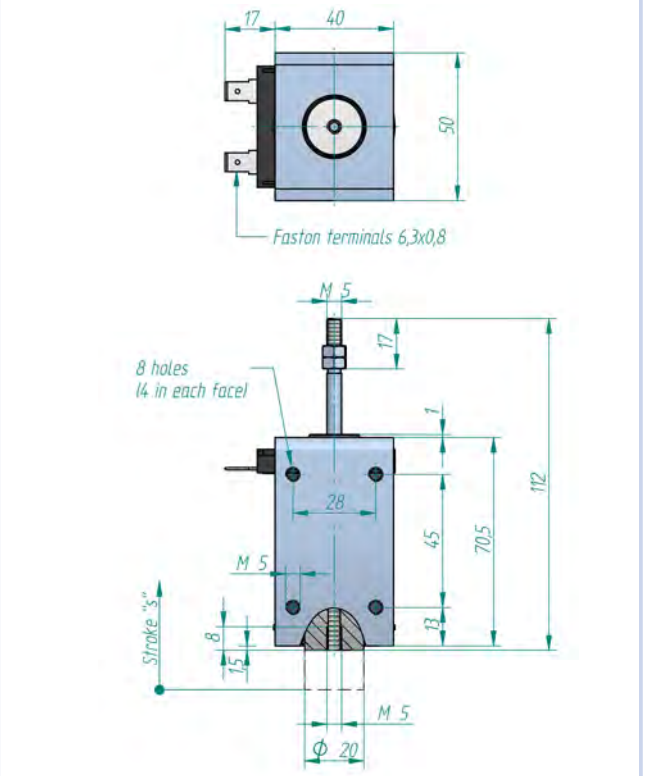
Duty-cycle ED(%)	100	40	25	15	5
Abs. Power at 20ºC (W)	18	45	70	110	280
Minimum force (N)	9.2	16.7	21.6	28.5	50
Max time under voltage(s)	∞	120	75	45	15
Plunger weight (g)	117				
Solenoid weight (g)	650				

Duty-cycle ED%	Standard voltages VDC							VAC		Under demand voltages 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

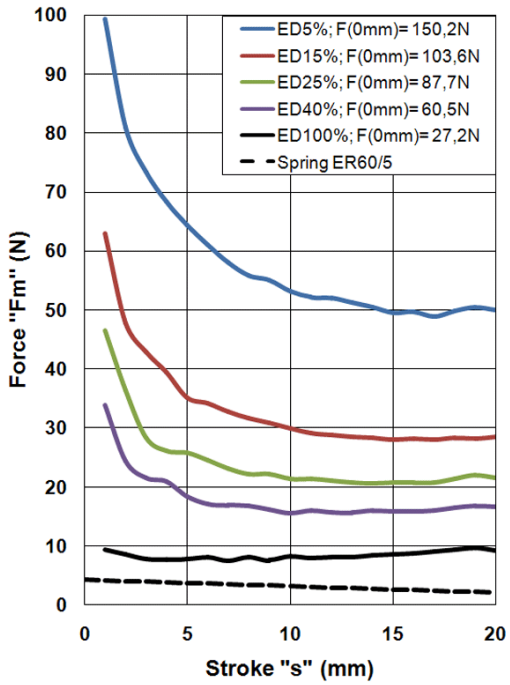
Layout: o = Available ; x = Unavailable

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)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 10

Ordering code: *ER60-20/C --V ED---%* - Mounting position - Spring

Example: Standard voltage:24Vdc Duty cycle: ED100%: Mounting position A: With spring : *ER60-20/C 24Vdc ED100% A RS*
Standard voltage:48Vdc Duty cycle: ED15%: Mounting position C: Without spring : *ER60-20/C 48Vdc ED15% C RN*

For fixation and positions (A,B,C,D) of the solenoid: see page 10

Spring yes: RS; Spring no: RN