ERB serie electromagnets are bistable linear solenoids, where the stroke movement from initial (unlocked) to final position (locked) is made by electromagnetic forces, the return to initial position takes place by an inverse polarizing pulse combined with external forces or by an incorporated spring. When it is off, the bistable solenoids has got two working and maintained positions. One will be held by a permanent magnet system and the other one by a return spring or external forces. Its specifications makes this solenoid perfect to use when both unlocking and locking position are kept for a long time.

**Structure, basic components:**

- **Magnetic body:**
  It is the metal part containing a coil, the core, a magnet system and the fixation holes.

- **Coil:**
  It receives the electrical energy to create a magnetic field.

- **Plunger:**
  It moves along and inside the coil, it has got a non-magnetic shaft fixed to the plunger. If pulling is needed, fix the element to activate to the plunger. To push, fix the shaft to the element to activate.

**Work depending on the feeding mode:**

<table>
<thead>
<tr>
<th>Locked position</th>
<th>Unlocked position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red cable: +Vdc</td>
<td>Red cable: -Vdc</td>
</tr>
<tr>
<td>Black cable: -Vdc</td>
<td>(F-S)Coil+magnet</td>
</tr>
<tr>
<td>(F-S) Spring</td>
<td>(F-S) Spring</td>
</tr>
</tbody>
</table>

**Datasheet rated values conditions (According to DIN VDE 0580):**

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), adding and substracting the plunger weight.

- **When the solenoid pulls upwards:**
  Transition of unlock to lock:
  Effective force = Magnetic force - Plunger weight - Spring force
  Transition of lock to unlock:
  Effective force = Spring force + Plunger weight

- **When the solenoid pulls downwards:**
  Transition of unlock to lock:
  Effective force = Magnetic force + Plunger weight - Spring force
  Transition of lock to unlock:
  Effective force = Spring force - Plunger weight

- **When the solenoid pulls in horizontal position**
  Transition of unlock to lock:
  Effective force = Magnetic force - Spring force
  Transition of lock to unlock:
  Effective force = Spring 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 and magnets.
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) Electronics integrated in the coil:

      a.1) For peak suppression

         Examples:

      a.2) Thermal fuse

         Examples:

         *The thermic resettable polyswitches 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) Thermal fuse and peak suppression

         Examples:

      a.4) Double coil

         Examples:

         Our standard ERB series has only a coil, that has to be electrically polarized to get the desired movement sense, to avoid this supply polarization inversion we can produce the ERB series with two coils, that will be feeded individually to get the desired movement sense. The two coil version solenoid will have less force than the single one or higher power for the same force as the coil has to be divided in two.

2. INSULATION CLASS CUSTOMIZATION:

   Depending on the model, insulation class can be increased until B(130°C).

3. PROTECCIÓN RATE CUSTOMIZATION IP (EN60529):

   The standard model are IP00, but for the mechanical part IP40 can be obtained and for the electrical part IP65 through coil overmolding.

4. MECHANICAL CUSTOMIZATION

   4.1) Shaft modifications:

      Length and shape can be modified.

      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:

      Model customized with extra holes and fixing sheet: ERB35/NS

      Standard model: ERB35/N

   4.4) Fastening element added as Fork joints as DIN71752:

      Example: ERB50/N+Fork joint

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

**ERB 20-15-06/C TYPE**

Protection rate: **IP00**
Insulation class: **Y (90°C)**
Reference cycle: **3 minutes**
Standard stroke (s): **8 mm**
Temperature rise "ΔVs": **70°C**
Working temperature: **-10 to 45°C**
Work: **Push / Pull**

Release spring will be incorporated by defect
Standard spring force: 
Fs(s=0mm) = 2.7N
Fs(s=8mm) = 1.1N

<table>
<thead>
<tr>
<th>(Un) Standard voltage (Vdc)</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ED) Duty-cycle ED(%)</td>
<td>20</td>
</tr>
<tr>
<td>(P20) Power at 20°C (W)</td>
<td>10</td>
</tr>
<tr>
<td>Available voltage (Vdc)</td>
<td>from 5 to 24</td>
</tr>
<tr>
<td>Available voltage (Vac)</td>
<td>NOT AVAILABLE</td>
</tr>
<tr>
<td>Max time under voltage(s)</td>
<td>30</td>
</tr>
<tr>
<td>Plunger weight (Kg)</td>
<td>0.011</td>
</tr>
<tr>
<td>Solenoid weight (Kg)</td>
<td>0.047</td>
</tr>
</tbody>
</table>

- Voltage under demand:
  - They can be manufactured at voltages between the maximum and minimum voltage values shown in the chart.
- If any customization from the original is needed, please ask us.
- Earthing is recommended if the metallic parts are accessible.

**Work depending on feeding mode:**

<table>
<thead>
<tr>
<th>Locked position</th>
<th>Unlocked position</th>
</tr>
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<tr>
<td>Red cable: +Vdc</td>
<td>Red cable: -Vdc</td>
</tr>
<tr>
<td>Black cable: -Vdc</td>
<td>Black cable: +Vdc</td>
</tr>
</tbody>
</table>

(F-S) Coil+magnet
(F-S) Spring
F-S: Force-stroke

**Ordering code:**
ERB20-15-06/C --V ED25% - Spring
Voltage: 24Vdc; Duty cycle: ED25%; With spring:
ERB20-15-06/C 24Vdc ED25% RS

Voltage: 12Vdc; Duty cycle: ED25%; Without spring:
ERB20-15-06/C 12Vdc ED25% RN

Spring yes: RS ; Spring no: RN

Calculation of the effective force: see pages 1 and 81
For fixation and mounting positions: see page 81
**Bistable linear solenoids**

**ERB 35-05/NC TYPE**

Protection rate: **IP00**  
Insulation class: **Y (90°C)**  
Reference cycle: 3 minutes  
Standard stroke (s): **8 mm**  
Temperature rise "\(\Delta V_s\)" : **70°C**  
Working temperature: **-10 to 45°C**  
Work: **Push / Pull**

**Release spring** will be incorporated by defect

**Standard spring force:**  
\(F_s(s=0mm) = 12.3N\)  
\(F_s(s=8mm) = 8.7N\)

<table>
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<tr>
<th>(Un) Standard voltage (Vdc)</th>
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<tbody>
<tr>
<td>(ED) Duty-cycle ED(%)</td>
<td>20</td>
</tr>
<tr>
<td>(P20) Power at 20°C (W)</td>
<td>35</td>
</tr>
<tr>
<td>Available voltage (Vdc)</td>
<td>from 6 to 205</td>
</tr>
<tr>
<td>Available voltage (Vac)</td>
<td>NOT AVAILABLE</td>
</tr>
<tr>
<td>Max time under voltage(s)</td>
<td>30</td>
</tr>
<tr>
<td>Plunger weight (Kg)</td>
<td>0.040</td>
</tr>
<tr>
<td>Solenoid weight (Kg)</td>
<td>0.165</td>
</tr>
</tbody>
</table>

**Work depending on feeding mode:**

Locked position  
Red cable: +Vdc  
Black cable: -Vdc

Unlocked position  
Red cable: -Vdc  
Black cable: +Vdc

- **(F-S) Coil+magnet**  
- **(F-S)Spring**  
- **F-S:Force-stroke**

- **Voltage under demand:**  
  They can be manufactured at voltages between the maximum and minimum voltage values shown in the chart.  
- If any customization from the original is needed, please ask us.  
- Earthing is recommended if the metallic parts are accessible.

**Ordering code:**  
ERB35-05/NC → V ED20% - Spring

- Voltage: 24Vdc; Duty cycle: ED25%; With spring: ERB35-05/NC 24Vdc ED20% RS  
- Voltage: 12Vdc; Duty cycle: ED20%; Without spring: ERB35-05/NC 12Vdc ED20% RN

Spring yes: RS  ;  Spring no: RN

**For fixation and mounting positions:** see page 81
Bistable linear solenoids

**ERB 35/N TYPE**

Protection rate: **IP00**
Insulation class: **Y (90ºC)**
Reference cycle: 3 minutes
Standard stroke (s): 5 mm
Temperature rise "ΔV/s": 70ºC
Working temperature: -10 to 45ºC
Work: Push / Pull

Release spring will be incorporated by defect

Standard spring force:
- Fs(s=0mm) = 12.3N
- Fs(s=5mm) = 10.5N

Ordering code: ERB35/N --V ED25% - Spring
- Voltage under demand: They can be manufactured at voltages between the maximum and minimum voltage values shown in the chart.
- If any customization from the original is needed, please ask us.
- Earthing is recommended if the metallic parts are accessible.

<table>
<thead>
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<td>Solenoid weight (Kg)</td>
<td>0.165</td>
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</tbody>
</table>

Work depending on feeding mode:

Locked position
- Red cable: +Vdc
- Black cable: -Vdc
- (F-S) Coil+magnet
- (F-S)Spring

Unlocked position
- Red cable: -Vdc
- Black cable: +Vdc

- Voltage under demand:

Calculation of the effective force:
see pages 1 and 81

For fixation and mounting positions: see page 81
Spring yes: RS  ;     Spring no: RN  For fixation and mounting positions: see page 81

- Voltage under demand:
  They can be manufactured at voltages  between  the maximum and minimum voltage values shown  in the chart.
- If any customization from the original is needed, please ask us.
- Earthing is recommended if the metallic parts  are accessible.

Ordering code:  ERB50/N  --V ED20% - Spring
  Voltage: 24Vdc; Duty cycle: ED20%; With spring:
  ERB50/N 24Vdc ED20% RS
  Voltage: 12Vdc; Duty cycle: ED20%; Without spring:
  ERB50/N 12Vdc ED20% RN

Calculation of the effective force: see pages 1 and 81
For fixation and mounting positions: see page 81
This solenoid has two resting positions, the stroke movement "s" from a position to the other one is made by a polarized electric signal, the plunger is retained in each end of stroke position using permanent magnets.

### Connection scheme: Coil in parallel will be the standard configuration.

**Voltage 6V - (Coil in parallel)**

- Red A
- White B

**Voltage 12V - (Coil in serie)**

- Red A
- White A and B

**Plunger stroke direction**

- Towards A
- Towards B

### Dimensional drawing:

- Connector: MULTICOMP MC34481
- Dimensions: 87 x 28 x 21 mm
- Stroke: 24 mm
- Connector INPUT 1: White cable COIL A, Red cable COIL B
- Connector INPUT 2: Red cable COIL A, White cable COIL B

### Force-stroke Curve (F-S)

- Force "Fm" (N)
- Stroke "s" (mm)

### Ordering code:

- **Coil in parallel**: ERDI15 6V 33%, (standard configuration)
- **Coil in serie**: ERDI15 12V 33%, (special configuration)
This solenoid has two stable positions, the stroke movement "s" from a position to the other one is made by a polarized electric signal, the plunger is retained in each end of stroke position using permanent magnets.

**Connection scheme**

<table>
<thead>
<tr>
<th>Connection 1</th>
<th>Connection 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>+VDC</td>
<td>-VDC</td>
</tr>
<tr>
<td>Connection 2</td>
<td>Connection 1</td>
</tr>
<tr>
<td>-VDC</td>
<td>+VDC</td>
</tr>
</tbody>
</table>

**Work depending on the feeding mode:**

- **Position A:** Connection 1: +VDC and Connection 2: -VDC. The shaft will go to B position
- **Position B:** Connection 2: +VDC and Connection 1: -VDC. The shaft will go to A position

**Dimensional drawing:**

- Tinned 5mm
- Red cable
- Black cable
- 8

**Force-stroke curve**

- Force "Fm" (N)
- Stroke "s" (mm)

**Protection rate:** IP40 EN60529
**Insulation class:** Y (90°C)
**Standard voltage:** 24Vdc
**Voltages under demand:** from 6Vdc to 250Vdc
**Standard stroke "s":** 6mm
**Duty-cycle ED:** 20%
**Abs. power at 20°C:** 28W (14W each coil)
**Plunger weight:** 0.028Kg
**Solenoid weight:** 0.175Kg
**Holding force at stroke 0mm:** 20N

*Obligatory earthing if the metallic parts are accessible.

**Ordering code:** ERDI35-06/CC-V ED20%

Voltage: 6Vdc: ERDI35-06/CC Vdc ED20%
Voltage: 24Vdc: ERDI35-06/CC 24Vdc ED20%
Solenoid protection rate: IP40
Insulation class: Y (90ºC)
Minimum release voltage: 6V
Duty-cycle ED: 100%
Standard stroke “s”: 8mm
Work: Push
Magnetic retention force (Frm): 44N
Initial force (Fe): 37N
Useful magnetic force (Fru=Frm-Fe): 7N
Final force (Fa): 18N
Mechanical response time: 5ms
Minimum energy of release: 30mJ
Minimum duration of the electrical impulse: 20ms
Solenoid weight: 0.190Kg

ECI serie electromagnets are bistable linear electromagnets, where the stroke movement from initial to final position is made by a incorporated spring.

When solenoid is in final position after been under voltage (See drawings bellow), the mechanical reset to the initial position has to be made by external forces acting on the mobile core.

The plunger is retained in the initial position by permanent magnets. To release the plunger is necessary feed the electromagnet with a low power polarized voltage signal.

ordering code: ECI35/C 6Vdc ED100%

---

ECI 35/C TYPE

Force-stroke curve

Position A (Initial position):
Repose status (compressed spring), when the electromagnet is fed, it passes to position B.

Position B (Final position):
After voltage status (spring free). To return to position A, will be necessary to apply an external force.

Solenoid push force

External force to reset

---

Solenoid with compressed spring

F_R = Spring force

---

ECI serie electromagnets are bistable linear electromagnets, where the stroke movement from initial to final position is made by an incorporated spring.

When solenoid is in final position after being under voltage (See drawings bellow), the mechanical reset to the initial position has to be made by external forces acting on the mobile core.

The plunger is retained in the initial position by permanent magnets. To release the plunger it is necessary feed the electromagnet with a low power polarized voltage signal.