



The image features a technical illustration of a ball-detent locking solenoid assembly. The background is a dark blue gradient. On the left, a large, detailed 3D rendering of the solenoid body is shown, with a blue and yellow wavy line looping around it. To the right, there are two circular cross-sectional diagrams. The top one shows a central pin with a diameter of $\varnothing 1.69$ and an outer diameter of $\varnothing 1.96$. Below it, a smaller diagram shows a similar cross-section. In the center, the text 'BALL-DETENT' is written in large, bold, orange letters, followed by 'LOCKING SOLENOID ASSEMBLIES' in white. Below this, the phrase 'Combined technologies for robust, uninterrupted performance' is written in white. At the bottom, the Magnet-Schultz logo is displayed, consisting of a stylized 'm' and 's' inside a circle, followed by the text 'MAGNET-SCHULTZ OF AMERICA' and 'SPECIALISTS IN ELECTROMAGNETIC DEVICES'. In the bottom right corner, there is a small technical drawing of a component with dimensions $\varnothing 1.69$ and (1.025) .

BALL-DETENT

LOCKING SOLENOID ASSEMBLIES

Combined technologies for robust, uninterrupted performance



MAGNET-SCHULTZ OF AMERICA
SPECIALISTS IN ELECTROMAGNETIC DEVICES



HARNESS THE *power*
OF COLLABORATIVE INNOVATION



Turning our knowledge into customer value



BALL-DETENT

LOCKING SOLENOIDS FOR HIGH STRENGTH LOCKING APPLICATIONS

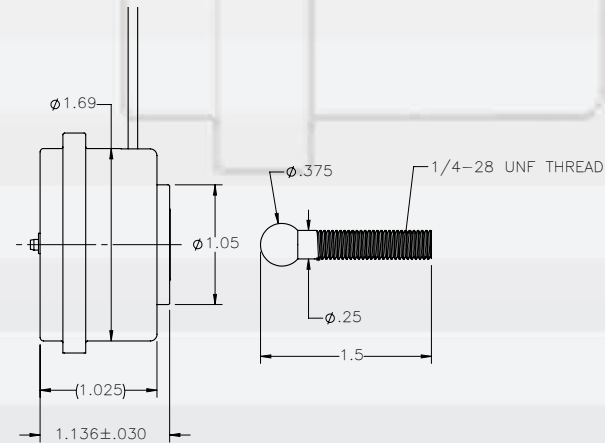
Magnet-Schultz of America's new Ball-Detent Locking (BDL) Solenoid is a device that can provide robust locking functionality, for use in any locking application where high locking force, in a compact size is needed.

This unique design blends the locking power of Ball-Detent technology with the linear motion of a solenoid—an approach that was deemed to be sufficiently unique to warrant filing patent application No. 14592511.

FAMILY OF BALL-DETENT LOCKING SOLENOID ASSEMBLIES

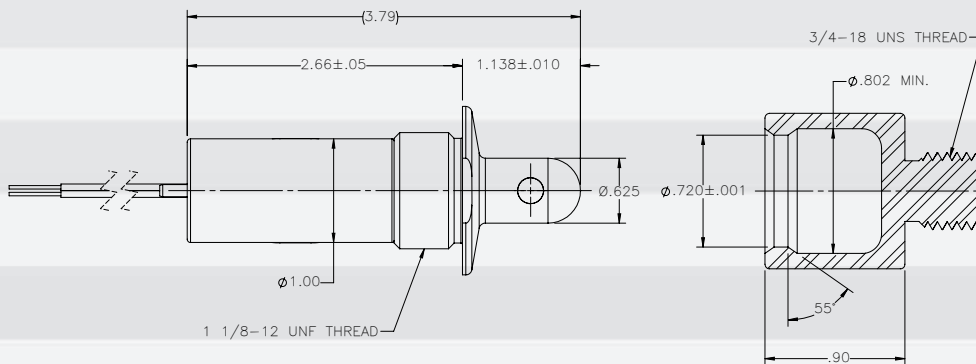
Common Features

- **FAIL-SAFE**—automatically unlocks when power is lost, or intentionally turned-off.
- **FAIL-SECURE**—remains locked when power is lost, or intentionally turned-off.
- **Compact Size** relative to the high locking forces these solenoids provide.
- **Dimensionally Scalable** to meet varying customer system requirements.



Integrated Locking-Receptacle (BDL) Solenoid

ABOVE: The dimensions of an existing design



Independent Locking-Receptacle (BDL) Solenoid

LEFT: The dimensions of an existing design



INDEPENDENT LOCKING-RECEPTACLE BDL SOLENOID

This member of the BDL Solenoid family features a ball-housing/solenoid assembly which mates with the independent locking-receptacle to effect the locking function. This solenoid is available in either a FAIL-SAFE, or a FAIL-SECURE configuration.

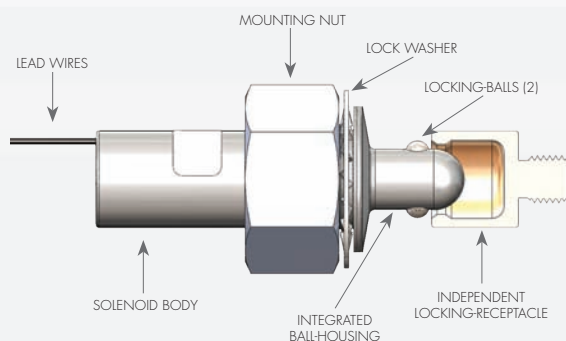


Figure 1

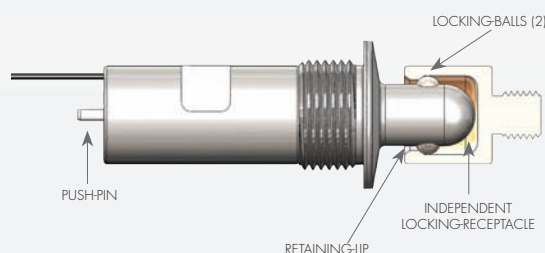


Figure 2

Figure 1: In a **FAIL-SAFE** version of this solenoid, when the solenoid is **de-energized**, the locking-balls are free to move radially inward, rendering the assembly “unlocked.” The ball-housing/solenoid can easily be inserted into, or withdrawn from the locking-receptacle because the locking-balls can easily be displaced by the locking-receptacle’s retaining-lip. This feature is what makes this variant FAIL-SAFE.

Figure 2: The ball-housing/solenoid is fully inserted into the locking-receptacle. When **energized**, the locking-balls will be constrained from moving radially inward, preventing them from being displaced by the retaining-lip, thus “locking” the device.

In a **FAIL-SECURE** version of this solenoid, a **de-energized** solenoid would be prevented from being inserted into, or withdrawn from the locking-receptacle, effectively “locking” the device. An **energized** solenoid would be free to go in either direction, “unlocking” the device.

INDEPENDENT LOCKING-RECEPTACLE BDL SOLENOID UNIQUE FEATURES

- **MOISTURE & DUST RESISTANT**
- **LOCKING/HOLDING FORCES** capable of exceeding 800 pounds of pull force, more/less is design dependent.
- **ENERGY REQUIRED TO UNLOCK** solenoid designs can be modified to suit the power available in any application.
- **MANUAL ACTUATION & POSITION SENSING**
Made possible by utilizing the push-pins.
- **ENERGY SAVING OPTION** available by incorporating a permanent-magnet into the solenoid. This negates the FAIL-SAFE or FAIL-SECURE features.
- **HIGH DURABILITY** up to one million operations.

Learn more about MSA’s family of Ball-Detent Locking Assemblies—
visit Magnet-SchultzAmerica.com or contact us directly at 630.789.0600.

INTEGRATED LOCKING-RECEPTACLE BDL SOLENOID

This member of the BDL Solenoid family features a locking-receptacle that is fully integrated into the solenoid body. Mating with an independent ball-shaft effects the locking function. This solenoid is also available in either a FAIL-SAFE, or a FAIL-SECURE configuration.

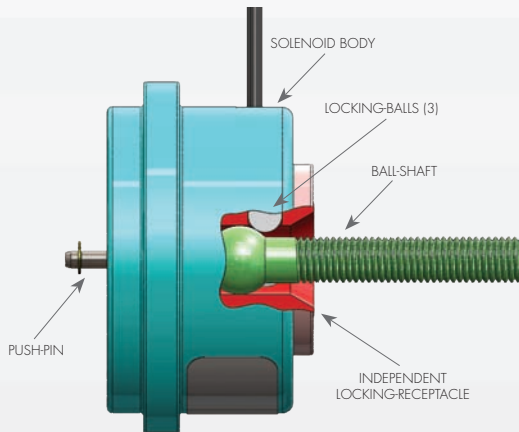


Figure 3

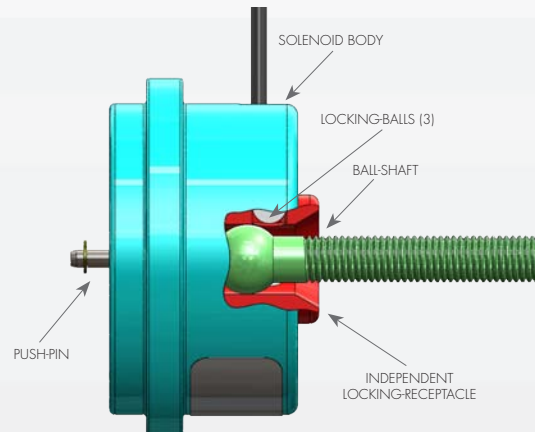


Figure 4

Figure 3: With the ball-shaft fully inserted into the integrated locking-receptacle, when **de-energized**, a **FAIL-SECURE** version of this solenoid will prevent the locking-balls from moving radially outward, rendering the assembly “locked”. This feature is what makes this variant FAIL-SECURE.

Figure 4: When **energized**, a **FAIL-SECURE** version of this solenoid will free the locking-balls to move radially outward, allowing them to be displaced by the ball-shaft as it is withdrawn from, or inserted into the locking-receptacle.

A **FAIL-SAFE** version of this solenoid will function opposite to what is described above for the FAIL-SECURE variant. **De-energizing** the solenoid will “unlock” the device. **Energizing** the solenoid will “lock” the device.

INTEGRATED LOCKING-RECEPTACLE BDL SOLENOID UNIQUE FEATURES

- **LOCKING/HOLDING FORCES** capable of exceeding 500 pounds of pull force, achieving more is design dependent.
- **HIGH DURABILITY** exceeding 250,000 operations, achieving more is possible with design changes.
- **ENERGY REQUIRED TO UNLOCK** solenoid designs can be modified to suit the power available in any application.
- **ENERGY SAVING OPTION** available by incorporating a permanent-magnet into the solenoid. This negates the FAIL-SAFE or FAIL-SECURE features.





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