

Special Sensor Report:

SOLENOID CITY'S
E SERIES ELECTROMAGNETIC
and Interface

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Robot: Mr. Tool

Description

Solenoid City's E-20-100 is a light duty electromagnet. In Mr. Tool, it is used to grasp ferrous tools and move them into a basket. Implementation is fairly simple in that the only circuitry needed is a TTL switch that can handle the high current needed to activate the electromagnet. Figure 1 depicts a drawing the magnet. A 10-32 thread is provided in the top for mounting purposes.

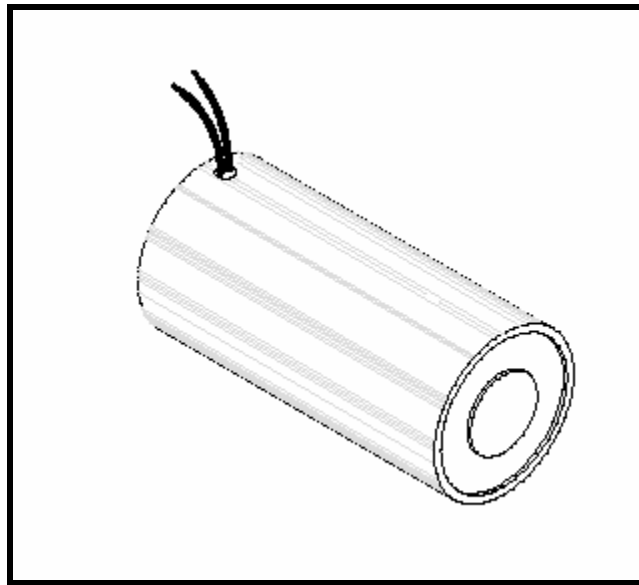


Figure 1. Solenoid City's E Series Electromagnet (Courtesy Solenoid City)

Advantages and Disadvantages

In a nutshell, this is the easiest way to pick up a ferrous object. Solenoid City's simple magnet is much easier to implement than any sort of robotic hand or grabber. This one advantage far outweighs the two disadvantages of weight and power consumption.

The E-20-100 is very robust at 5.3 ounces. The robot platform that incorporates this particular model must be capable of moving it. Moreover, plywood platforms would be questionable. The second disadvantage is power consumption. From Figure 2, at a typical 4-12V robot platform, the magnet consumes from typically .5A at 4 Watts to 1.5A at 12 Watts (assuming an average 8V system). Therefore, power supplies and switches must be chosen to accommodate this demand.

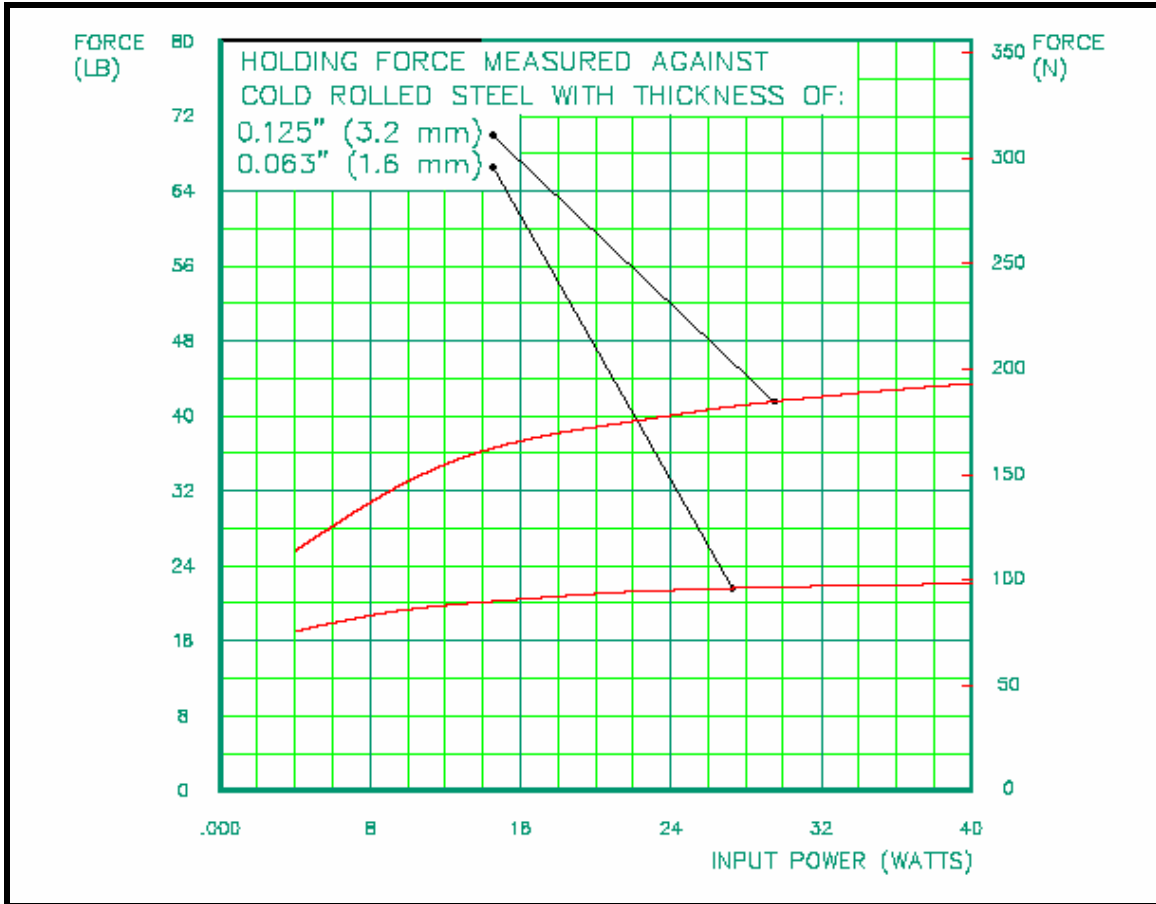


Figure 2. Power Consumption vs. Holding Force (Courtesy Solenoid City)

Interface

Figure 3 shows the typical interface. As stated earlier, a high power capacity switch is needed to control the current to the magnet. In this case, a Fairchild HUF76107 Power FET was chosen because of its high handling capacity. It is capable of loads up to 20A and 30V. These criteria exceed the needs of the electromagnet.

The gate is activated by standard TTL signals, therefore making the design positive logic. The FET can be directly connected any port pin on a microprocessor that supply TTL levels on output ports. When the gate is driven high, the Power FET supplies ground closing the circuit and energizing the magnet's core.

The 120kΩ pull down resistor is added to ensure an off state in the event of a floating input.

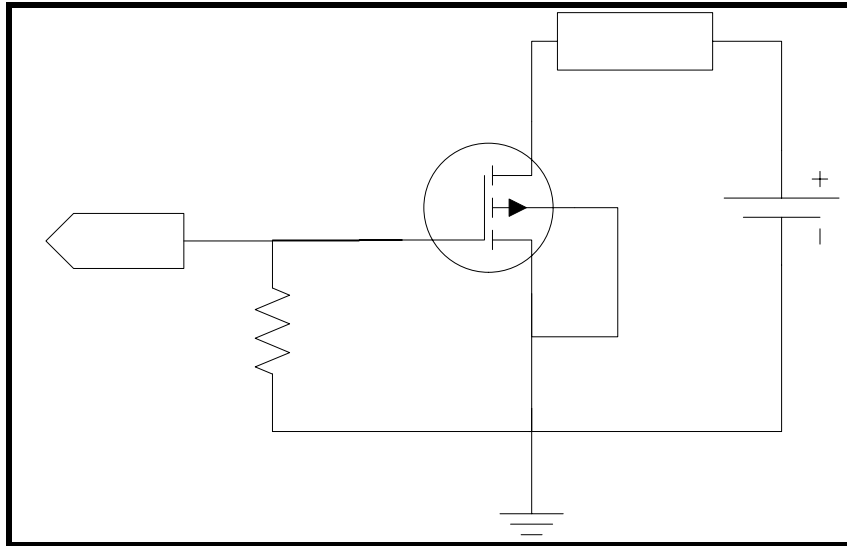


Figure 3. Interface Circuit

Availability and Cost

The E-20-100 can be easily purchased online through www.solenoidcity.com for a price of \$35 plus shipping. Other magnets are available to fit most applications.

Sources:

“E-20-100.pdf” Datasheet, www.solenoidcity.com

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