



## CE ELECTROMAGNETIC LIFTING MAGNET OPERATIONS MANUAL Models CE5 through CE20

P.O. #:  Order #:  Part #:

### INTRODUCTION

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This manual presents Safety & Maintenance direction for IMI / Walker CE magnet systems for Lifting and Material Handling. If used and maintained properly, it should serve for many years.

IMI/Walker Products have proven to be among the best designed and safest in the industry. Note that if used improperly, any CE magnet can be rendered inefficient and unsafe. It is absolutely essential that anyone who uses this lifting magnet, and is responsible for its application, be trained on how to use it correctly.

CE electromagnetic lifting magnets are specially designed for in-plant or outdoor handling of steel plate, bar stock, castings, forgings, or machined components in all types of industrial plants, steel warehouses, shipyards and fabricating shops. These magnets can be used individually or in multiples with various suspension systems.

The systems can be engineered and supplied complete with power supply, controls and battery back-up.

The maximum rated lift capacity is based upon lifting clean, smooth, flat, low-carbon steel plate of ample thickness with the full area of the magnet's lifting surface in contact with the load. De-rating is required for plates with rust or scale, thin plates, and alloy steels. More detailed ratings are contained in the following pages.

CE magnets are operated by magnet controllers which may be customer-supplier or purchased as part of a system from IMI.

CE Features:

- Low-carbon steel body for maximum magnetic performance
- Heavy-duty, fully moisture-protected coils wound for 50% duty cycle
- Coiled cord and twist lock adapter for quick connection to DC power source (magnet controller required)
- Mating twist lock receptacle provided for installation convenience

Options include:

- |                             |                                 |                         |
|-----------------------------|---------------------------------|-------------------------|
| • High strength steel bales | • Custom sizing                 | • Custom spreader beams |
| • Magnet controller         | • High temperature applications | • Custom attachments    |



**READ THIS MANUAL CAREFULLY TO LEARN HOW TO OPERATE AND MAINTAIN THE MAGNET. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY TO THE OPERATOR AND OTHER INDIVIDUALS IN THE AREA.**

**THIS MANUAL SHOULD BE CONSIDERED A PERMANENT PART OF THE MAGNET AND SHOULD ALWAYS BE AVAILABLE TO ALL OPERATORS, AND REMAIN WITH THE MAGNET IF IT IS RE-SOLD.**

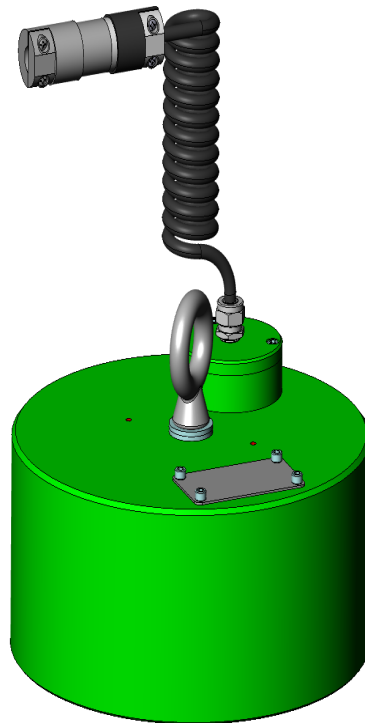
To request additional copies of this manual, call 1-800-662-4638.



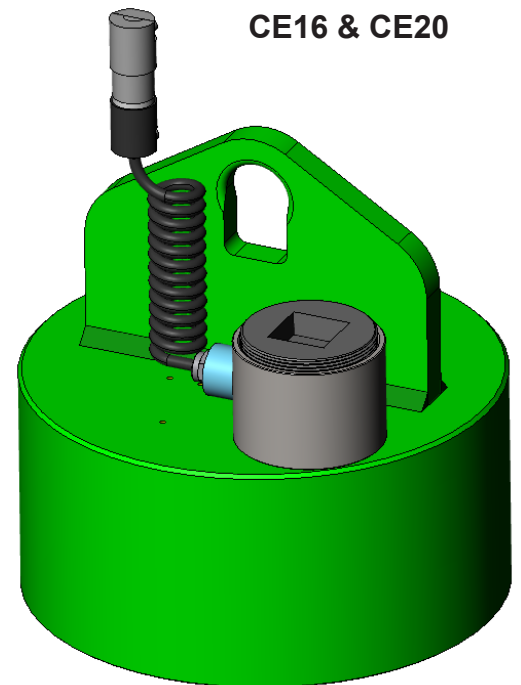
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**CE05 & CE07**



**CE09 & CE12**






**CE16 & CE20**





## SAFETY INSTRUCTIONS RECOGNIZE SAFETY INFORMATION

The following indications are provided as alerts to special considerations:

 <b>DANGER</b> Red Background, White Letters	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.	<p><i><b>These Hazard Signal Words Deserve your Full Attention</b></i></p>
 <b>WARNING</b> Orange Background, Black Letters	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.	
 <b>CAUTION</b> Yellow Background, Black Letters	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.	



Follow these simple rules to avoid lifting incidents:

Never attempt to use this magnet until this manual has been reviewed and understood.



Always make sure that the supporting structure and load attaching devices (i.e. crane, chains and hook) are rated to support the weight of the magnet and load.

Always make sure that the load's weight and dimensions are within the Magnet's Lifting Guidelines. These Guidelines are located in this Manual.



Never use this magnet to lift or transport people.  
Never lift more than one workpiece at a time with this magnet.



Never lift loads over people or in close proximity to people.  
Never leave any lifted load unattended.

Always stay clear of the load.  
Always let those nearby know that a lift is to begin.



Please be advised that in and around the application of magnetic equipment, there are potential safety concerns that can arise with sensitive medical devices:

- Pacemaker behavior can be affected when they are near strong magnetic fields
- Medical implants and external fixation systems can be influenced by magnetic fields
- Hearing aid behavior may be affected when exposed to strong magnetic fields

Any individual that carries the above equipment or other sensitive medical devices should use caution when they are around or handling magnets. For more specific information the wearer should contact their physician.



Beware of pinch points from sudden attraction and unexpected movement between magnets and ferrous metal equipment components or tools.



When working in an area using lifting magnets, wear safety glasses, work gloves, steel-toed shoes and a safety hat.

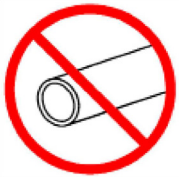
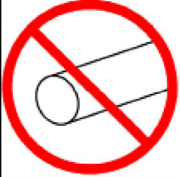




**SAFETY INSTRUCTIONS (CONTINUED)**

Danger always exists when loads are transported by lifting devices, especially when the equipment is not being used properly or is poorly maintained. Special safety precautions apply to the operation, inspection, and maintenance of the Walker Lift Magnets.

Proper lifting knowledge and techniques are the responsibility of the operator. Be sure to read and understand the instructions and safety warnings contained in this manual before using the magnet.

**UNSAFE LIFTING APPLICATIONS FOR CE MAGNETS**

		<p><b>⚠ DANGER</b></p> <ul style="list-style-type: none"> <li>» <b>Never</b> lift any pipe, solid round or structural shapes with this magnet unless it is configured for the shape.</li> <li>» <b>Never</b> lift any castings that do not have a machined flat lifting surface for the magnet. The location of the lifting surface should be such to permit the load to remain level when lifted.</li> </ul>
		
IMI can provide other type magnets for these applications.		
For specific model magnets see lifting guidelines for structural shapes.		

	<b>⚠ DANGER</b>
	<b>Never</b> lift a load by its narrowest dimension.

<b>⚠ WARNING</b>	If there is any difficulty lifting a load, <b>DON'T LIFT IT!</b> Call IMI for advice at 1-800-662-4638
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## SAFETY INSTRUCTIONS (CONTINUED)

### WAYS TO AVOID A REDUCTION OF LIFTING CAPACITY



## DANGER

### To Avoid a Reduction of Lifting Capacity:

- The lifting surfaces of the magnet and the area of the load where the magnet will be located must be clean, smooth, flat and free of nicks and burrs.
- The full area of the magnet's lifting surface must be in contact with the load.
- The load must be low carbon steel such as SAE 1020.
- The magnet's lifting surface must stay level and the contacting surface of the load remain flat.
- The temperature of the magnet and/or the load must not be greater than 110°F (43°C).
- Repair of this magnet should only be performed by IMI or a Qualified (Designated) Person.\*\*
- Do not exceed the magnet duty cycle. Exceeding the duty cycle will result in reduced lifting capacity (see page 12).
- If there is any difficulty lifting a load, DO NOT LIFT IT! Call IMI for advice at 1-800-662-4638.

### ADDITIONAL WARNINGS



## WARNING

- Never lift loads with any dimension greater than those shown in the LIFTING GUIDELINES.
- Never operate damaged or malfunctioning magnets.
- Never remove or damage Operating and Warning labels.
- Persons using pacemakers or other medical devices should not use this magnet until they have consulted with their physician.



## WARNING

- Disassembly or repair of this magnet can result in reduced holding power and/or cause an unsafe condition. Anytime the magnet is disassembled beyond the parts list shown in this manual, the magnet must be re-tested for breakaway force in accordance with ASME B30.20.
- Modification of any operating mechanism or structure of this magnet can reduce the magnet's effectiveness and/or cause an unsafe condition.
- Repair or modification of this magnet should only be performed by IMI\*

### SAFETY PERSON

IMI recommends that a person be assigned to review all magnetic handling applications for these magnets to ensure that safe practices and procedures are being followed.

\* IMI replacement parts may be installed by a \*\*Designated Person.

\*\* Designated Person: A person selected or assigned by the employer as being competent to replace specific replacement parts listed in this manual and able to verify proper functioning of the specific replacement parts and the entire product after the completion of the installation.



## ADDITIONAL SAFETY INFORMATION

### ASME B30.20 “Below the Hook Lifting Devices” Safety Standard

IMI Lift Magnets are designed and manufactured in accordance with the ASME B30.20 standard and the associated ASME BTH-1 Design Standard. These American National Standards cover the design, construction, testing, installation, operation, and maintenance of Close Proximity Operated Lifting Magnets and Remotely Operated Lifting Magnets.

#### Close Proximity Operated Lifting Device

A magnetic lifter is considered a close proximity lifting device if:

It is used in such a fashion that the operator manually positions the lifting magnet on the load, and manually guides the lifting magnet and the load during the lift.

#### Remotely Operated Lifting Device

A magnetic lifter is considered a remotely operated lifting magnet if:

The magnet does not require the operator or other personnel to be in close proximity to the lifting magnet or its load while the lifting magnet is in use.

## INSTALLATION INSTRUCTIONS

### BEFORE INSTALLING THE LIFTING MAGNET and/or MAGNET SYSTEM

1. Unpack the lifting magnet and/or magnet system and check that all components have been included and are undamaged after shipment.
2. Observe all instructions and warnings in this manual and on the magnetic lifter.
3. If everything in this manual is not understood, contact IMI for assistance before using the magnetic lifter.
4. Check that the load rating of the hoisting equipment exceeds the total weight of the load plus the weight of the magnetic lifter.
5. If the magnetic lifter is to be installed on an existing crane, hoist, or other type hoisting equipment, move it to a location where it will cause the least interference with other equipment and operations in the area.
6. Place all power controllers in the “OFF” position.

**Only qualified personnel should install this lifting magnet and/or magnet system.**



## WARNING

- All electrical wiring should be installed by a qualified electrician and must conform to national, state / province, and local electrical codes.
- Prior to beginning installation, check that all sources of power are disconnected, locked out, and tagged “out of service”.
- Determine the voltage and current rating of the magnetic lifter. This information is marked on the magnet or system’s nameplate.



## INSTALLATION INSTRUCTIONS (continued)

### CONNECTING ELECTRICAL POWER DISCONNECTS

(In accordance with the ASME B30.20 safety standards)

- A separate Magnet circuit disconnect switch, independent of the hoisting equipment's disconnect switch, shall be provided. The Magnet circuit disconnect switch must be of the enclosed type with provision for locking, flagging, or tagging in the open (off) position and have means for discharging the inductive energy of the magnet. The Magnet circuit disconnect switch must be connected on the line side (power supply side) of the hoisting equipment disconnect switch.
- Power supplied to magnets from DC Generators can be disconnected by disabling the external powered source connected to the DC generator, or by providing a circuit switch that disconnects excitation power to the generator and removes all power to the magnet.
- Disconnects are not required on externally powered electromagnets operating from a 120 V AC single phase power source.

### ELECTRICAL GROUNDING

All IMI electromagnetic lifting magnets are provided with provisions to ground the electrically conductive body of the magnet in order to facilitate compliance with the governing electric codes.

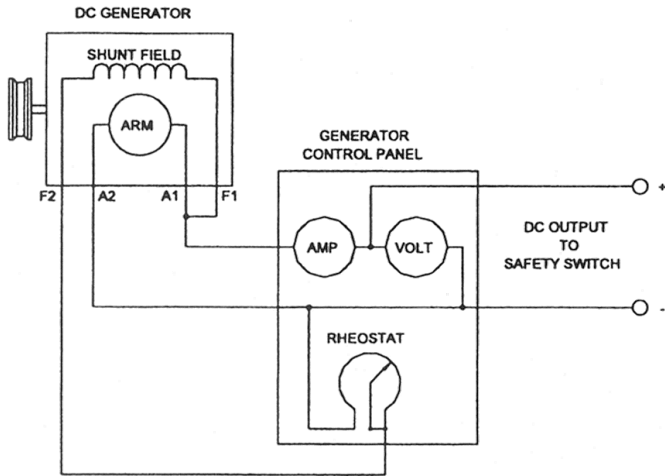
#### **WARNING**

- Each magnet is supplied with a safety ground wire or a grounding lug for attachment of a safety ground wire. The green or green with yellow stripe safety ground wire provided with most magnets is attached to the body of the magnet.
- It is the responsibility of the electrical installer to verify that the magnet is electrically wired and grounded properly and in accordance with the local and national electric code for the intended application.
- In the US, the governing national standard is the National Electric Code NFPA 70. Article 250 contained in this code is devoted to the grounding requirements for various types of installations.
- Prior to energizing the electromagnetic device, check all the electrical connections and confirm that the metal body of the electromagnetic device is electrically grounded.



## INSTALLATION INSTRUCTIONS

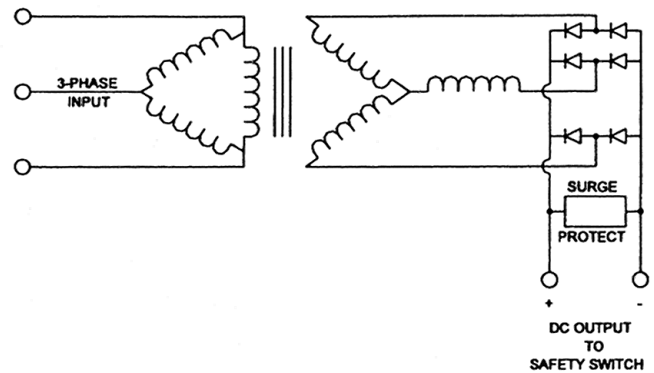
### TYPICAL GENERATOR SCHEMATIC



Connections on generator shown for C.C.W. rotation facing commutator end. Interchange field connections for clockwise rotation.

Eliminate control panel by connecting F2 to A2. Voltage will then be controlled by generator RPM only.

### TYPICAL RECTIFIER SCHEMATIC



Rectifier must be rated for magnet service and be equipped with surge protection.

Rectifier may have options such as: AC circuit breaker, AC line contractor, DC metering, Indicator lights, fuses or circuit breakers, which are not shown above.

## MAGNET SUPPRESSION

When energized, an electromagnet creates a large magnetic field and the magnet coil contains large amounts of energy. Capacitive discharging occurs when a magnet coil dissipates its energy internally.

When the current producing source is removed from an inductive device, such as the coil of a magnet, the energy stored in the inductor produces work in order to bring the system into equilibrium.

In the case of a magnet coil, when the source of power is removed, the voltage potential between one end of the coil and the other increases rapidly, and if a suitable median exists, the electrons flow from one end to the other through the median. In other words, the movement of electrons, from one end of the coil to the other, over or through the conductor, is the work produced by the stored energy.

The energy stored in a magnet coil is normally controlled through external circuitry, usually located in the electrical magnet controller. IMI controls employ a suppressor/resistor network across the magnet to accomplish this.

If a control other than an IMI control is to be used, ensure that the controller provides adequate suppression. Adequate suppression is defined as any circuit which provides a continuous current path.

For technical assistance, contact your IMI representative.



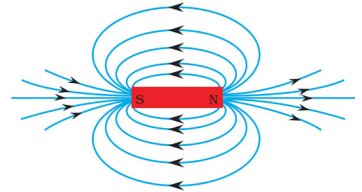


# OPERATING INSTRUCTIONS

## IMPORTANT FACTS FOR THE OPERATION OF LIFT MAGNETS

### LOAD CHARACTERISTICS OTHER THAN JUST WEIGHT MUST BE CONSIDERED IN ORDER TO DETERMINE THE LOAD THAT ANY MAGNET CAN LIFT.

This statement is true for all lifting magnets because they all operate using the same fundamental laws of physics. Magnetic power is often pictured as lines of magnetic force flowing from north pole to south pole. Anything that limits the flow of these magnetic lines of force reduces the magnet's lifting capacity. There are many important factors which limit the flow of these lines of force.



## 1. LOAD THICKNESS

The greater the number of lines of magnetic force flowing from a magnet into the load, the greater the effectiveness of the magnet. The thicker the load, the more lines of magnetic force are able to flow. Beyond a certain thickness of load, no additional lines of force will flow because the magnet has reached its full capacity.

- Thin material (load) means less iron available, and thus fewer lines of magnetic force flow from the magnet into the load. Therefore, the lifting capacity of the magnet is reduced.
- In some cases the magnet will attract more than one thin plate of material when set on a stack of thin plates. DO NOT LIFT more than one plate at a time since the lower plate may not be held sufficiently.
- The lifting guidelines provide the user with what minimum thickness of load is required to reach full lifting capacity. Below such thickness of load, the user must accept the reduced lifting capacity of the magnet as shown in the guidelines.

## 2. SURFACE CONDITIONS

Magnetic lines of force do not flow easily through air; they need iron in order to flow freely. Therefore, anything that creates a space or an air gap between a magnet and the load limits the flow of magnetic lines of force, and thus reduces the lifting capacity of a magnet.

- **MAGNET'S LIFTING SURFACE CONDITION** — The lifting surfaces of a magnet must be clean, smooth, flat and free of nicks and burrs to minimize the air gap between a magnet and the load. The CE magnet has been designed with soft, low carbon steel lifting surfaces in order to maximize the lifting capacity; special care must be taken to protect these surfaces. Follow the Inspection Instructions in this manual. Attaching or welding other materials to the lifting surfaces in order to reduce wear should not be done with this magnet because it will reduce the lifting capacity.
- **LOAD SURFACE CONDITION** — Paper, dirt, rags, rust, paint, and scale act the same as an air gap. A rough surface finish on the load also creates an air gap between the magnet and load.

Any of these conditions will reduce the magnet's lifting capacity.



## **IMPORTANT FACTS FOR THE OPERATION OF LIFT MAGNETS (continued)**

### **3. LOAD ALLOY**

Low carbon steels, such as SAE 1020 steel, are nearly as good conductors of magnetic force as pure iron. However, many other alloys contain non-magnetic materials which reduce the ability of magnetic force to flow into the load. An alloy such as SAE 300 series stainless steel is almost as poor a conductor of magnetic force as air.

Type 416 stainless steel is considered magnetic, but it contains enough chromium so that a magnet can develop only one-half as much force on a type 416 stainless steel load as it can on a SAE 1020 steel load.

The force developed on cast iron, because of the carbon content, is less than one-half the force compared with SAE 1020 steel. Chilled cast iron further reduces the force to less than one-quarter.

### **4. LOAD LENGTH OR WIDTH**

As the length or width of a load increases, it ceases to remain flat when lifted and the edges begin to droop. This drooping or sagging of the load can create an air gap between the load and the magnet. This is called peel; if peel occurs, the lifting capacity of the magnet is greatly reduced.

For plate lifting, where peel often occurs, rectangular shaped magnets must be positioned so that the length of the magnet is parallel to the width of the load.

### **5. POSITION OF MAGNET'S LIFTING SURFACE**

As the position of the magnet's lifting surface changes from horizontal to vertical, the lifting capacity of the magnet decreases. When the magnet's lifting surfaces are vertical, the lifting capacity of the magnet is minimized and dependent upon the coefficient of friction between the magnet's lifting surface and the load.

### **6. PORTION OF MAGNET SURFACE IN CONTACT WITH LOAD**

The full surface of the magnet must contact the load if the magnet is to achieve rated lift capacity.

### **7. LOAD TEMPERATURE**

The temperature of the load can cause damage to the magnet and, if high enough, can even change the magnetic characteristics of the load. For Standard Lift Magnets, Walker should be consulted if the load or air temperature exceeds 110° F (43° C).

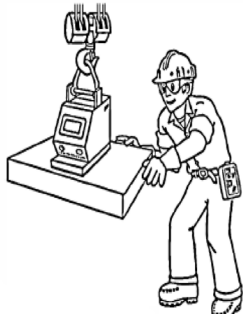


## RECOMMENDED LIFTING PROCEDURES



**NEVER** attempt to operate a lift magnet without reading and understanding the **OPERATOR'S MANUAL & SAFETY INSTRUCTIONS.**

**1**



Check the condition of the magnet prior to every lift. **WIPE** clean the bottom of the magnet and the area on the load where the magnet will be located. File away burrs.

**2**



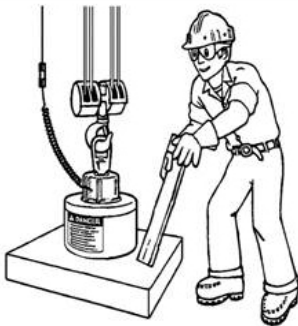
Position the magnet so the load remains level.

**3**



Energize the magnet according to the indicated functions of the magnet controller. To obtain maximum lift, allow a few seconds for the magnet to reach full power before lifting the load.

**4**



Check to be sure no one is near the load to be lifted. Inform others in the area that a lift is to begin. Lift the load 2 to 3 inches (50 to 75 mm) and then jar the load to insure that adequate holding power is available. **ALWAYS STAY CLEAR OF THE LOAD.**

**5**



Lift and move the load **SMOOTHLY**. Avoid jarring and swinging the load while it is in transit. **KEEP THE LOAD LEVEL.** **NEVER** let the load come in contact with any obstruction.

**6**



Carefully set the load down. De-energize the magnet by selecting the appropriate control functions on the magnet controller. Hold the release function for 2 - 3 seconds, then lift the magnet slightly to be sure the load has been released.



### WARNING

If there is any difficulty lifting a load, **DON'T LIFT IT!**  
Call IMI for advice at 1-800-962-4638



### CAUTION

**NEVER** re-energize the magnet until it has been placed in contact with the load to be lifted. Prematurely energizing the magnet could cause unwanted materials to be attracted to the magnet or the load to unexpectedly jump to the magnet face. **PERSONAL INJURY MAY RESULT.**



## RECOMMENDED LIFTING PROCEDURES (continued)

### ■ SAFETY HOOK LATCH

Always use a safety hook latch onto the crane hook to hold the magnets.

### ■ STAY CLEAR OF THE LOAD

Guide the load by pushing or pulling the edges of the load.

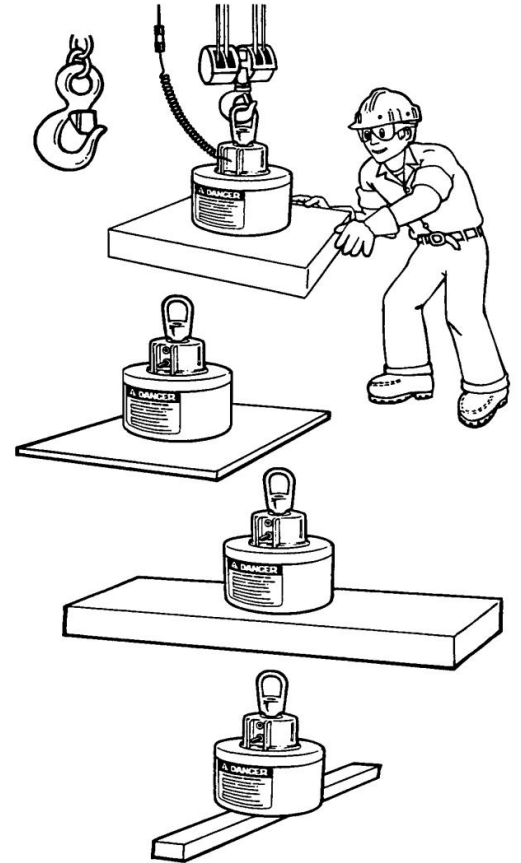
### ■ PLATE LIFTING

Position the magnet so that it is centered on the plate. Never lift any plate less than 1/4" (6mm) thick. (See Important Facts 2 & 4).

### ■ BAR LIFTING

When the load width is greater than the magnet diameter, position the magnet length so the entire lifting surface of the magnet is in contact with the load.

When the load width is narrower than the magnet's diameter, position the magnet so that it is centered on the width of the load.



## DUTY CYCLE

### DO NOT EXCEED THE DUTY CYCLE RATING OF THE MAGNET.

Exceeding the duty cycle will result in reduced lifting capacity due to the excessive heat that will build up in the magnet.

Duty cycle rating (D.C.%) is defined as:  $(\text{Time On} \times 100) / (\text{Time Off} + \text{Time On}) = \text{D.C.}\%$  and is expressed as a percent, with a maximum of 10 minutes Time On to avoid overheating the magnet.

To maximize the effectiveness of the magnet(s), keep power off when the magnet(s) are not in use.



- EXAMPLES:** 3 minutes on, 1 minute off equals:  $(3 \times 100) / (3 + 1) = 75\%$   
 5 minutes on, 5 minutes off equals:  $(5 \times 100) / (5 + 5) = 50\%$

The duty cycle rating of the magnet(s) is marked on the magnet nameplate.



## GUIDELINES FOR REDUCTION OF RATED LIFT CAPACITY



Each magnet model is rated for a different weight limit. Load characteristics will affect the lifting capacity of the magnets. The lifting guidelines for the various models are shown on the following pages.

The Lifting Guidelines tables show the effect of air gap, load thickness, load length, and load width on lifting capacity. As the thickness of the load decreases, so does the rated lifting capacity of the magnet. The tables show the maximum weight or load size which can be lifted for each thickness under varying air gap conditions.

### DO NOT EXCEED EITHER THE MAXIMUM WEIGHT OR SIZE FOR EACH THICKNESS.

Each value shown on the Lifting Guidelines charts is for SAE 1020 steel, and any increase in alloy content will result in further reduction of the lifting capacity of the magnet.

THIS TABLE PROVIDES REDUCTION FACTORS FOR SELECT MATERIAL OTHER THAN SAE 1020 STEEL	
Reduction Factors for Materials Other than SAE 1020 Steel	
Materials	REDUCTION FACTOR
Cast Steel	0.90
3% Silicon Steel	0.80
SAE 1095 Steel	0.70
416 Stainless Steel	0.50
Cast Iron (non-chilled)	0.5
Pure Nickel	0.10
For other materials consult IMI	

**Rated lift Capacity = Reduction Factor multiplied by Maximum Load Value**

*For 1020 Steel, from Lifting Guidelines for plate. See page 12 & 13.*

Example: Model CE09 lifting SAE 1095 STEEL, ½" thick, ROUGH machined flat surfaces:

**Rated Lift Capacity = 0.70 multiplied by 600 = 420 pounds.**



### ADDITIONAL OPERATING INFORMATION

Avoid dropping, banging, or slamming the magnet into other objects.

These lifting magnets are electromagnetic devices. Do not allow water to enter the magnet body.



**WARNING**

If there is any difficulty lifting a load, **DON'T LIFT IT!**  
Call IMI for advice at 1-800-962-4638



**LIFTING GUIDELINES - PLATE**

**CE05, CE07, and CE09 (for SAE 1020 plate)**

MAGNET MODELS	LOAD THICKNESS	TYPE OF SURFACE CONDITION					
		CLEAN & SMOOTH Similar to a Flat (32 micro-inch RMS) Ground Surface .000" Max. Air Gap †		RUST OR SCALE Similar to a Flat Hot Rolled Steel Surface .010" Max. Air Gap † (.254mm)		IRREGULAR OR ROUGH Similar to a Flat Smooth Cut File .020" Max. Air Gap † (.508mm)	
		Max. Load (lbs.)	Max. Size (ft.)	Max. Load (lbs.)	Max. Size (ft.)	Max. Load (lbs.)	Max. Size (ft.)
CE05	<b>NEVER LIFT ANY LOAD WITH ANY DIMENSION GREATER THAN 5 FEET (1.5 meters)</b>						
	Over 1"	600	-	400	-	370	-
	* 1"	600	3 x 4	400	3 x 3	370	3 x 3
	*3/4"	530	4 x 4	375	3 x 4	350	3 x 3
	*1/2"	480	4 x 5	350	4 x 4	330	4 x 4
	*3/8"	400	5 x 5	275	4 x 4	200	3 x 4
	*1/4"	180	4 x 4	150	3 x 4	125	3 x 4
CE07	<b>NEVER LIFT ANY LOADS WITH ANY DIMENSION GREATER THAN 6 FEET (1.8 meters)</b>						
	Over 1-1/2"	1200	-	1100	-	900	-
	*1-1/2"	1200	4 x 4	1100	4 x 4	900	3 x 4
	*1"	1000	4 x 5	950	4 x 5	900	4 x 5
	*3/4"	850	5 x 5	775	5 x 5	700	4 x 5
	*1/2"	700	5 x 6	650	5 x 6	550	5 x 5
	*3/8"	450	5 x 5	420	5 x 5	400	5 x 5
*1/4"	200	4 x 4	190	4 x 4	180	4 x 4	
CE09	<b>NEVER LIFT ANY LOADS WITH ANY DIMENSION GREATER THAN 8 FEET (2.4 meters)</b>						
	Over 2"	2400	-	2300	-	2000	-
	*2"	2400	5 x 5	2300	5 x 5	2000	4 x 5
	*1-1/2"	2200	6 x 6	2100	5 x 6	1800	5 x 5
	*1"	1700	6 x 6	1550	6 x 6	1400	5 x 6
	3/4"	1400	6 x 7	1300	6 x 7	1250	6 x 6
	*1/2"	700	5 x 6	650	5 x 6	600	5 x 5
	*3/8"	525	5 x 6	480	5 x 6	450	5 x 5
*1/4"	250	4 x 5	220	4 x 5	200	4 x 4	

\* LIFTING CAPACITY IS AFFECTED BY PEEL AND THICKNESS. SEE NOTES 1 & 4 OF THE "IMPORTANT FACTS" (PAGE 7 & 8) IN THIS MANUAL.

† SEE NOTE 2 OF THE "IMPORTANT FACTS" (PAGE 7) IN THIS INSTRUCTION MANUAL. ALSO READ RECOMMENDED LIFTING PROCEDURES (PAGE 9 & 10).

**Values shown are for maximum rated capacities when operating instructions and warnings are followed.**

**Values are based upon SAE 1020 steel. Higher alloy steels and other magnetic materials will require further reductions of these rated capacities.**

**See Guidelines for the Reduction of Rated Lifting Capacity on previous page.**





**LIFTING GUIDELINES (PLATE)**

**CE12, CE16, and CE20 (for SAE 1020 plate)**

MAGNET MODELS	LOAD THICKNESS	TYPE OF SURFACE CONDITION					
		CLEAN & SMOOTH Similar to a Flat (32 micro-inch RMS) Ground Surface .000" Max. Air Gap †		RUST OR SCALE Similar to a Flat Hot Rolled Steel Surface .010" Max. Air Gap † (.254mm)		IRREGULAR OR ROUGH Similar to a Flat Smooth Cut File .020" Max. Air Gap † (.508mm)	
		Max. Load (lbs.)	Max. Size (ft.)	Max. Load (lbs.)	Max. Size (ft.)	Max. Load (lbs.)	Max. Size (ft.)
CE12	<b>NEVER LIFT ANY LOAD WITH ANY DIMENSION GREATER THAN 10 FEET (3.1 meters)</b>						
	Over 2"	4000	-	3850	-	3475	-
	2"	4000	7 x 7	3850	6 x 7	3475	6 x 7
	*1-1/2"	3500	7 x 8	3250	7 x 7	3000	7 x 7
	*1"	2800	8 x 8	2500	7 x 8	2300	7 x 8
	*3/4"	2100	8 x 8	2000	8 x 8	1900	7 x 8
	*1/2"	1100	7 x 7	1050	7 x 7	1000	7 x 7
	*3/8"	600	6 x 6	550	6 x 6	500	5 x 6
*1/4"	300	5 x 5	250	4 x 5	200	4 x 4	
CE16	<b>NEVER LIFT ANY LOADS WITH ANY DIMENSION GREATER THAN 12 FEET (3.7 meters)</b>						
	Over 2-1/2"	7250	-	6750	-	6250	-
	*2-1/2"	7250	8 x 8	6750	8 x 8	6250	7 x 8
	*2"	6000	8 x 9	5500	8 x 8	5000	7 x 8
	*1-1/2"	5000	9 x 9	4600	8 x 9	4300	8 x 8
	*1"	4000	9 x 10	3750	9 x 10	3500	8 x 9
	*3/4"	2500	9 x 9	2300	8 x 9	2200	8 x 8
	*1/2"	1300	7 x 8	1200	7 x 8	1100	7 x 7
*3/8"	750	7 x 7	700	6 x 7	600	6 x 6	
*1/4"	350	5 x 6	300	5 x 5	250	4 x 5	
CE20	<b>NEVER LIFT ANY LOADS WITH ANY DIMENSION GREATER THAN 15 FEET (4.6 meters)</b>						
	Over 2-1/2"	10500	-	9800	-	9200	-
	*2-1/2"	10500	10 x 11	9800	10 x 10	9200	10 x 10
	*2"	10000	11 x 11	9500	10 x 11	9000	10 x 11
	*1-1/2"	8000	11 x 12	7600	11 x 11	7200	10 x 11
	*1"	5500	11 x 12	5200	11 x 11	5000	10 x 11
	*3/4"	3000	10 x 10	2800	9 x 10	2600	9 x 9
*1/2"	1500	8 x 9	1400	8 x 8	1300	7 x 8	

\* LIFTING CAPACITY AFFECTED BY PEEL AND THICKNESS. SEE NOTES 1 & 4 OF THE "IMPORTANT FACTS" (PAGE 7 & 8) IN THIS MANUAL.

† SEE NOTE 2 OF THE "IMPORTANT FACTS" (PAGE 7) IN THIS MANUAL. ALSO READ RECOMMENDED LIFTING PROCEDURES (PAGE 9 & 10).

**Values shown are for maximum rated capacities when operating instructions and warnings are followed.**

**Values are based upon SAE 1020 steel. Higher alloy steels and other magnetic materials will require further reductions of these rated capacities.**

**See Guidelines for the Reduction of Rated Lifting Capacity page .**



## INSPECTION AND MAINTENANCE INSTRUCTIONS

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### EVERY LIFT

- » Keep the lifting surfaces of the magnet CLEAN, SMOOTH, FLAT, FREE OF RUST and any FOREIGN MATERIALS. Nicks and burrs on the lifting surfaces will reduce the lifting capacity. If burrs occur, they can be removed by filing them away. However, care must be taken to protect the neighboring lifting surfaces.
- » Deep nicks may require regrinding of the entire lifting surfaces. (See Weekly Inspection Instructions)

### DAILY

- » Check the entire magnet's case, lifting surfaces, bail or eyebolts, and welds for cracks or other defects. If present, DO NOT USE THE MAGNET - Contact a Qualified Person or IMI.
- » Check the eyebolt or lift bail for wear. If the eyebolt or lift bail is worn to 80% of its original dimension, it should be replaced. Retighten the eyebolt if loose.
- » Check physical condition of power cord. Repair or replace any suspicious components. Also, check that the twist lock type electric connector is securely attached to the electrical receptacle.
- » Check the condition of the Operating Instruction label and Product Safety signs. The magnet was supplied with one (1) Lifting Guidelines/Operating Instruction label and one (1) Product Safety sign. If these labels and signs are missing or damaged, they should be replaced.

### WEEKLY

- » The lifting surfaces of the magnet should be checked for flatness and wear. Uneven wear and out of flatness can greatly reduce the lifting capacity because it will cause a non-magnetic separation (air gap) between the magnet and the flat surface of the load. Some nicks and burrs will occur on the lifting surfaces due to normal usage. However, when the flat contact area of the entire magnet's lifting surfaces becomes less than 90% of the original total lifting surface, it should be taken out of service until the lifting surfaces are reground.\*
- » Check the rigid epoxy of the encapsulated coil. Contact Industrial Magnetics or a Qualified Person for repair instructions.

\*Regrinding the lifting surfaces.

If regrinding is necessary, all the lifting surfaces must remain flat and in the same plane. After regrinding, the magnet must be re-tested for breakaway force in accordance with the test described in ASME B30.20

Industrial Magnetics recommends that lifting magnets be re-tested for breakaway force each year.



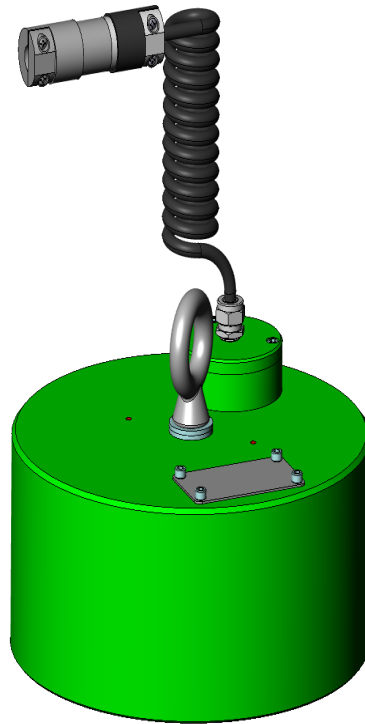


**SPECIFICATION AND PARTS LIST**

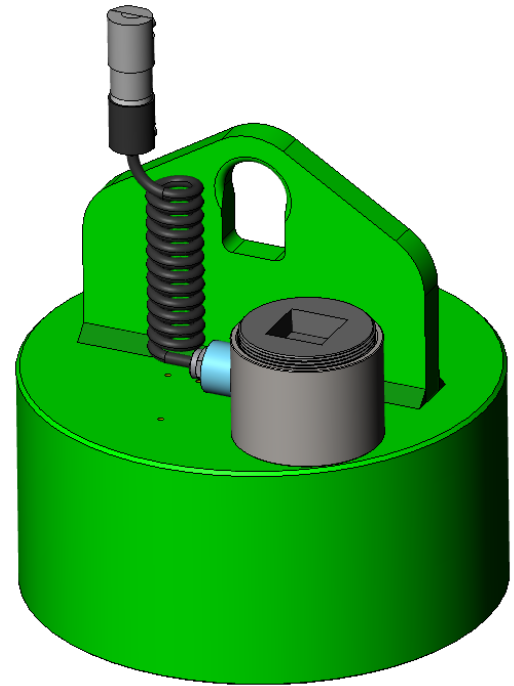
SPECIFICATIONS						
Model No.	CE05	CE07	CE09	CE12	CE16	CE20
Working Load Limit (LBS)	600	1,200	2,400	4,000	7,250	10,500
Power (Watts)	92	135	210	420	546	1048
Net Wt. (LBS)	13	39	90	138	295	530
Body height	10.95"	11.75"	12.50"	12.50"	15.25"	16.38"
Outside Diameter	5.13"	6.75"	9"	12"	16"	20"



**CE05 & CE07**



**CE09 & CE12**



**CE16 & CE20**

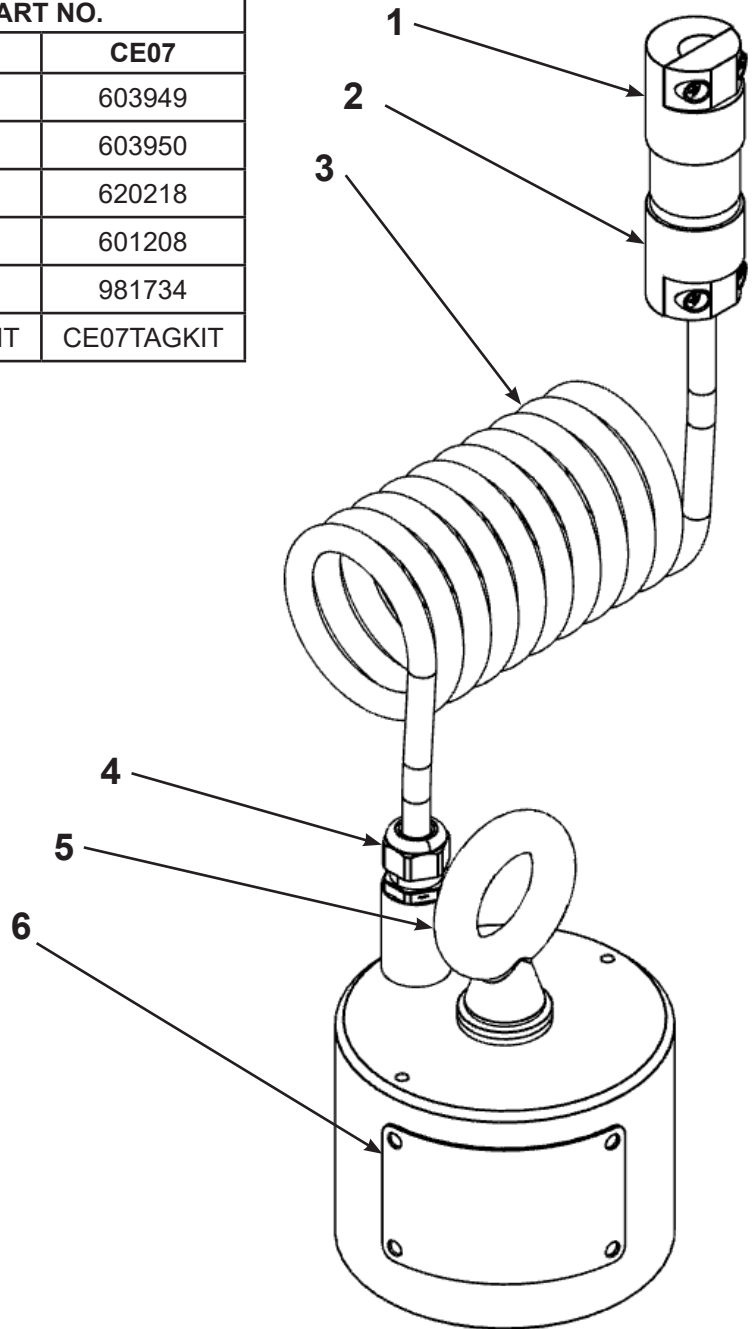
REPLACEMENT PARTS DIAGRAMS & LISTS	
CE05 & CE07	See Page 16
CE09 & CE12	See Page 17
CE16 & CE20	See Page 18



## PARTS LIST

### CE05 and CE07 Replacement Parts List

ITEM NO.	PART DESCRIPTION	PART NO.	
		CE05	CE07
1	RECEPTACLE, TWIST LOCK	603949	603949
2	PLUG, TWIST LOCK	603950	603950
3	COIL CORD	620218	620218
4	STRAIN RELIEF	601444	601208
5	EYEBOLT	981734	981734
6	ID TAG	CE05TAGKIT	CE07TAGKIT



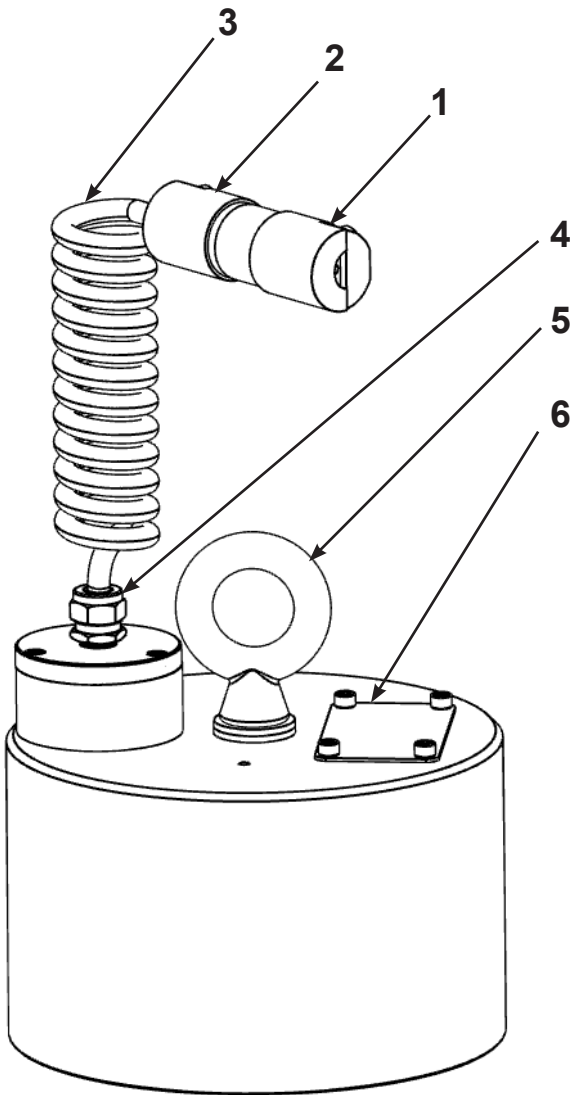
**⚠ WARNING**

**IMPROPER WIRING CAN RESULT IN REDUCED HOLDING POWER.**



## PARTS LIST

### CE09 and CE12 Replacement Parts List



ITEM NO.	PART DESCRIPTION	PART NO.	
		CE09	CE12
1	RECEPTACLE, TWIST LOCK	603949	603949
2	PLUG, TWIST LOCK	603950	603950
3	COIL CORD	10-5052	10-5052
4	3/8 NPT CORD GRIP	17-0014	17-0014
5	EYEBOLT	981734	981734
6	ID TAG	CE09TAGKIT	CE12TAGKIT

**⚠ WARNING**

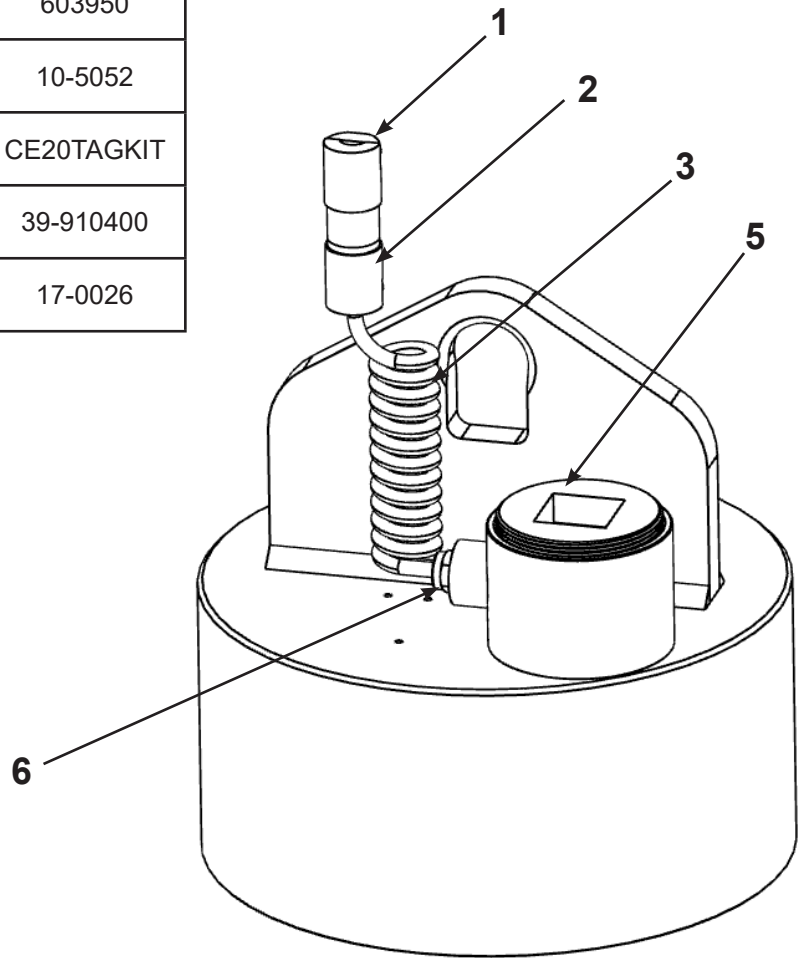
**IMPROPER WIRING CAN RESULT IN REDUCED HOLDING POWER.**



## PARTS LIST

### CE16 and CE20 Replacement Parts List

ITEM NO.	PART DESCRIPTION	PART NO.	
		CE16	CE20
1	RECEPTACLE, TWIST LOCK	603949	603949
2	PLUG, TWIST LOCK	603950	603950
3	COIL CORD	10-5052	10-5052
4	ID TAG (not shown)	CE16TAGKIT	CE20TAGKIT
5	PIPE CAP 4NPT	39-910400	39-910400
6	1/2 NPT CORD GRIP	17-0026	17-0026



**⚠ WARNING**

**IMPROPER WIRING CAN RESULT IN REDUCED HOLDING POWER.**





## TROUBLE SHOOTING

In many cases of poor magnet performance, the difficulty can be traced to the power supply, controller, or cable reel assembly. If these elements are found to be in good working order, the magnet can be checked with the following simple tests.

If a lifting magnet is suspected to be faulty, preliminary electrical tests can be made from the external leads.

1. Disconnect power to the magnet before making any electrical tests on your magnet.
2. Make electrical tests at outside leads. If tests indicate an open coil, ground, or low case to coil resistance, disconnect cable and connector and make further tests at coil leads. On some magnets, this will require removal of the terminal box cover. If these tests are satisfactory, trouble is then in the outside leads, connectors, controller, or power supply.

### **DANGER**

**Use extreme care when opening a magnet's terminal box. Contents may be under extreme pressure. Allow magnet to cool to ambient temperature before opening terminal box.**

## MAGNET TEST PROCEDURES

These tests should be performed when the magnet temperature is close to ambient temperature (70° F) and has not been operated for at least 10 hours.

### COIL RESISTANCE TEST

1. Use a Wheatstone Bridge, Kelvin, or other accurate ohmmeter (e.g., Fluke 115 or 179).
2. Connect meter leads to terminal junction. If the resistance is lower than that shown on the magnet's nametag or by calculating the coil resistance by dividing 230 volts by the amps on the nametag, shorted turns are indicated. If the resistance is less than 75% of this resistance, DO NOT operate magnet, as it is likely to cause extreme overheating and may cause serious damage to the coil material.

### GROUND INSULATION TEST "MEGGER TEST" (Case to Coil Resistance)

1. Use a 500-volt Megger (e.g., Fluke 1503 or 1507).
2. Connect one Megger lead to terminal junction and the other to a clean surface of the magnet casing. If the reading is between 20 Megohms and infinity, it is typical of a brand new IMI magnet. If the reading is between 10 & 20 Megohms, the insulation is sound. If the insulation is between 1 and 10 Megohms, the insulation is still acceptable. However, the insulation has degraded and the magnet should be closely monitored for further deterioration. If the reading is less than 1 Megohm, it should be returned to the factory for further inspection. Zero Megohms indicates a dead short.



## **MAGNET TEST PROCEDURES continued**

### **WHAT CAN AFFECT THE GROUND INSULATION TEST (Case to Coil Resistance)**

1. The most common difficulty is moisture.
2. The most likely entry point is the terminal box because the box has not been properly maintained and sealed.
3. The second most likely entry point is the bottom plate area because the bottom plate has been damaged and the welds have fractured.

Once the moisture enters the coil cavity, the coil insulation degrades and permits the current to arc or trace through the moisture to the case.

### **AC CURRENT TEST**

A more accurate test for shorted turns can be made by checking the current that will flow through the magnet with a 220 volt 60 cycle power supply connected to the magnet leads. A good quality ammeter should be used to perform this test. To establish a value, which can be used in a comparison with future readings, this test should be performed on the magnet upon receipt from the manufacturer. If provided with the serial number of the magnet, IMI can supply the results of the pre-shipment AC Current Test. Future test readings, which are higher than the initial test value, indicate that additional shortened turns are present.

#### **If all tests meet the magnet specifications, the problem can be:**

1. Low Voltage
2. Controller Trouble
3. Cable Reel - Ground or Shorts
4. Worn or Broken Cable




## RETURN and REPAIR INTRUCTIONS

For warranty and non-warranty repairs on any part of the magnet system, contact IMI at 1-800-582-0821.

- A return authorization number will be issued along with any applicable packaging and shipping instructions.
- After receipt of the components to be repaired, IMI will perform an inspection and provide an estimate of the repair costs.
- Authorization from the customer must be obtained by IMI before repairs are initiated.
- Transportation charges, both to and from the factory, are the sole responsibility of the customer unless otherwise agreed upon.

For technical assistance contact IMI.

 **WARNING**

- Disassembly or repair of this magnet can result in reduced holding power and/ or cause an unsafe condition. Anytime the magnet is disassembled beyond the parts list shown in this manual, the magnet must be re-tested for breakaway force in accordance with the test described in ANSI/ASME B30.20.
- Modification of any operating mechanism or structure of this magnet can reduce the magnet's effectiveness and/or cause unsafe conditions.
- Repair or modification of this magnet should only be performed by IMI \* or a Designated Person \*\*

\* IMI replacement parts may be installed by a \*\*Designated Person.

\*\* Designated Person: A person selected or assigned by the employer as being competent to replace specific replacement parts listed in this manual and is able to verify the proper functioning of the specific replacement parts and the entire product after the completion of the installation.

**This product is manufactured in accordance with ASME B30.20**  
**For further information, refer to Chapter 20-3 Close Proximity Operated Lifting Magnets**

### COMMENTS OR CONCERNS?

We believe Industrial Magnetics, Inc. offers the finest Lifting Magnets available today. Great pride has gone into the design and manufacture of these units.

Any comments or concerns should be directed to our Customer Service Department at 1-888-582-0822.

**We appreciate the opportunity to serve you!**