

# Euclid™ Lifting Magnet Controller

## Varistor Type Automatic Discharge

4291

Specification 4291 • May 2004 • Replaces July 1990

### General Information

The Euclid Type 4291 Magnet Controller is for use with all types and makes of lifting magnets. It assures fast and clean release of all types of magnet loads.

All or just part of the load may be dribbled, if desired. In addition, because of the circuit design, the magnet and magnet leads are not subjected to high induced voltages.

- ◆ Automatically discharges magnet.
- ◆ Fast and clean release of load.
- ◆ Peak magnet induced voltage limited to under 700 volts.
- ◆ Wide reverse current adjustment for different types of magnet loads.
- ◆ Mechanically interlocked mill-type "Lift" and "Drop" contactors.
- ◆ High-thermal capacity varistor discharge.
- ◆ Permanently connected discharge path.
- ◆ Discharge path completely independent from the line.
- ◆ "Drop" contactor opens automatically at end of drop cycle.
- ◆ Front wired, front removable components.
- ◆ Long contact life.
- ◆ Minimum maintenance.
- ◆ Full voltage reverse current.
- ◆ NEMA 3R Enclosed

### Application

Euclid Type 4291 Lifting Magnet Controllers have many uses from light scrap handling to extremely heavy plate or billet handling. The flexibility of this magnet controller is illustrated by the ease of proper "cleaning" that can be accomplished when switching from one type of material to another. A simple adjustment of the potentiometer (P1) is all that is necessary. An inherent dribble characteristic is designed into each unit allowing material sorting such as steel plate stacking, by releasing one plate at a time.

### Description

The Euclid Type 4291 Magnet Controller incorporates time proven components arranged to provide a new concept in magnet controller design and operation.

This controller includes all necessary power and reverse current contactors in addition to discharge path components.

Euclid's standard mill-type contactors are used to carry the power to the magnet. The



### Euclid Lifting Magnet Controllers Provide 3-Way Release of Load

Euclid Type 4291 automatic discharge type magnet controller is the only one on the market today that will assure (1) fast and clean release of full load, (2) accurate release of partial load and (3) precise control of dribbling. It can be used with all types and makes of lifting magnets in any industrial application.

reverse current or "Drop" contactor is also a mill-type contactor. The commonly used discharge resistor has been replaced by a high thermal capacity varistor connected in series with a silicon rectifier to assure a permanently connected independent discharge path at all times around the magnet.

Main power of "Lift" contactors, due to the circuit design described herein, need only Euclid's exclusive arc-centering, high-arc interrupting system to handle the highly inductive magnet circuit.

The high thermal capacity of the nonlinear varistor dissipates the energy stored in the magnet at a much lower value of induced voltage than does the usual fixed type discharge resistor. The varistor assembly is a bank of silicon-carbide composition discs connected in parallel and cooled by aluminum radiating plates.

The maximum induced voltage permitted by the varistor is a peak of 700 volts. This feature assures extra protection of the magnet and lead system insulation. It also minimizes destructive arcing on the "Lift" contactor.

**Non-linear characteristics of the varistor** help maintain the discharge voltage at the maximum allowable voltage until all of the

stored magnet energy is dissipated. The Euclid Type 4291 Magnet Controller dissipates stored energy as fast as any comparable device, but with a much lower induced voltage. It is not necessary to close the "Drop" contactor immediately to provide a discharge path.

Full line voltage, for cleaning the magnet, is applied to the magnet terminals when the value of the induced magnet voltage declines to nearly the line voltage value. Resistors are eliminated from the reverse current circuit. This allows the reverse current to build up as fast as the magnet inductive characteristics will permit.

During the time of the stored energy dissipation, the reverse voltage across the magnet and the discharge varistor assembly signals the discharge Sensor Module (DSM) that the discharge cycle has begun. When the discharge voltage falls to 250 to 300 volts, the "DSM" closes a pilot Drop Relay (DR) that energizes the Drop Contactor (D).

The adjustable time reverse current cycle begins with the closing of the Drop Relay after practically all the stored magnet energy is dissipated by the Discharge Varistor (DVA) assembly. The DSM also controls the length of the reverse current cycle. After a preset



period, controlled by the Potentiometer (P1) assembly, the DSM de-energizes the Drop Relay. This causes the Drop contactor to open and end the reverse current cycle.

The remaining reverse magnet current flows through a secondary discharge path from the magnet through the normally closed "power auxiliary" interlock of 2L, the DVA and back to the magnet.

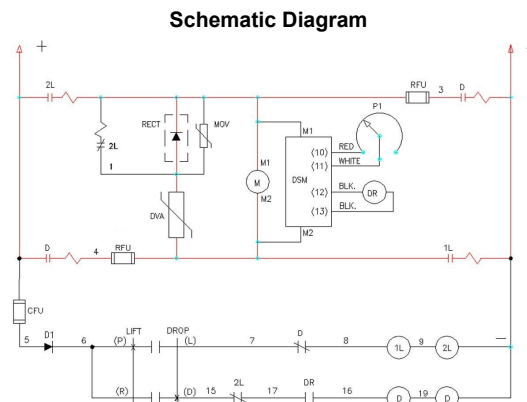
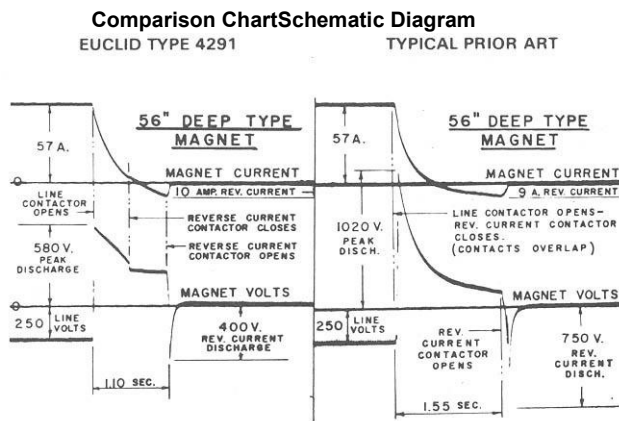
The Euclid magnet controller can be operated by a small notched position master switch or a maintained contact-type pushbutton station.

The arrangement of the circuit components allows an operator to drop portions of a load with ease. This is a feature most operators will appreciate. A portion of the load can be dropped by merely moving the master switch only the distance necessary to momentarily de-energize the "Lift" contactor. This feature is possible because of the permanently connected discharge path and the elimination of having to close the "Drop" contactor before opening the "Lift" contactor.

**FANNING PACKAGE** includes Fanning Contactor and Fanning Resistor for separate

mounting suitably enclosed for NEMA 2 or NEMA 3R service.

Fanning is the insertion of a resistor discharge path in parallel with the DVA to give extended magnet discharge time that is activated by a separate fanning pushbutton. The operator is allowed to control the rate of magnet discharge, dropping all or part of the load, by activating the fanning control. Releasing the fanning pushbutton deactivates the fanning control and returns the magnet controller to the lift mode to retain the remaining magnet load.



Exact reproductions of oscillograms showing the discharge performance of a EUCLID Type 4291 Magnet Controller and of a typical prior art Magnet Controller.

Symbol	Function	Symbol	Function
DR	DROP RELAY	MOV	SURGE SUPPRESSOR
PI	POTENTIOMETER ASSEMBLY	DVA	DISCHARGE VARISTOR
CFU	CONTROL FUSE	DSM	DISCHARGE SENSOR MODULE
RFU	DROP FUSE	D	DROP CONTACTOR
DI	DIODE	2L	LIFT CONTACTOR
RECT	RECTIFIER, MAGNET DISCHARGE PATH	1L	LIFT CONTACTOR



**Controller Selection Chart**

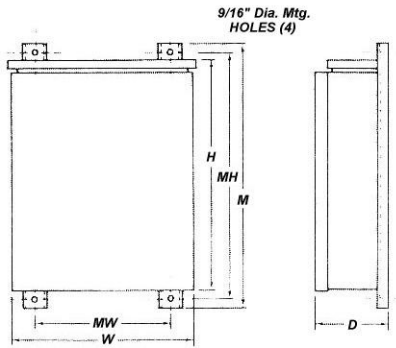
Size	System Voltage	Control Voltage	Max <sup>1</sup> Magnet Current	Part Number	Min Cold Magnet Ohms
<b>Full Voltage Automatic Discharge</b>					
2	230/250	230/250	50	91804-202	5.50
3	230/250	230/250	130	91819-202	1.92
4	230/250	230/250	175	91805-202	1.43
5	230/250	230/250	350	91806-203	0.71
5A	230/250	230/250	500	91902-XXX	0.50
2	230/250	12/24	50	91842-XXX	5.50
3	230/250	12/24	130	91820-202	1.92
4	230/250	12/24	175	91831-202	1.43
5	230/250	12/24	350	91845-XXX	0.71
5A	230/250	12/24	500	XXXXX-XXX	0.50
<b>Reduced Voltage, Automatic Discharge, Varistor Discharge <sup>2</sup></b>					
3	250/180	230/250	130/101	91877-XXX	1.92
4	250/180	230/250	175/137	91815-202	1.43
5	250/180	230/250	350/274	91880-202	0.71
5A	250/180	230/250	500/391	91916-002	0.50
<b>Generator Booster Type, Automatic Discharge, Varistor Discharge</b>					
3	275/200	230/250	130/95	91810-202	1.92
4	275/200	230/250	175/127	91811-202	1.43
5	275/200	230/250	350/255	91812-202	0.71

<sup>1</sup> When ordering, please specify cold magnet current. Resistor price includes covers.

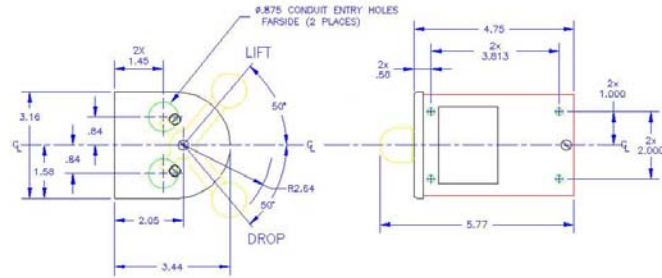
<sup>2</sup> These controllers are for use on a constant potential DC System with reduced voltage type lifting magnets (230V/180V or 230V/140V). They require a separate mounting magnet economizing resistor bank. The resistor bank is priced separately and designed based on the magnets requirements.



**APPROXIMATE DIMENSIONS & WEIGHTS**  
DO NOT USE FOR CONSTRUCTION PURPOSES



CABINET OUTLINE SIZE 1, 2, 3, 4 & 5



J2M4215

**Full Voltage Controllers & Full Voltage Booster Type Controllers**

CONTROLLER SIZE	W	H	D	M	MW	MH	NET WT.
2	22¼"	40⅛"	13"	43½"	14"	42"	150 Lbs.
3	22¼"	40⅛"	13"	43½"	14"	42"	180 Lbs.
4	22¼"	40⅛"	13"	43½"	14"	42"	190 Lbs.
5	31¼"	48¼"	16"	51⅝"	23"	50⅞"	Consult Factory

**Reduced Voltage Controllers**

CONTROLLER SIZE	W	H	D	M	MW	MH	NET WT.
3	24¼"	40⅛"	13"	43½"	16"	42"	Consult Factory
4	24¼"	40⅛"	13"	43½"	16"	42"	
5	31¼"	48⅞"	16"	51⅝"	23"	50⅞"	

**PILOT DEVICES & ACCESSORIES ADDITIONS FOR MAGNET CONTROLLER**

Description	Part Number
"Lift-Drop" NEMA 1 enclosed Master Switch (Standard for Euclid Lifting Magnet Controllers) (Light Industrial Duty)	J2M4215
Type 4211 "Lift-Drop" NEMA 3R enclosed Master Switch (Industrial Duty)	4211-99848-012
Type 4211, "Lift-Drop" NEMA 1 Surface Mounting Master Switch (Industrial Duty)	4211-99848-001
Type 4211, "Lift-Drop" NEMA 1 Flush Mounting Master Switch (Industrial Duty)	4211-99848-002
Type 2016, Catalog #SWPBC-MXI "Lift-Drop" NEMA 4 Maintained Type Surface Mounting Pushbutton Station	Consult Factory

**SPARE PARTS KIT**

Used With Magnet Controller Part Number	Spare Parts Kit Part Number	Spare Parts Kit Includes
4291-91804-202	59401-002	1 - Set of Contacts, Springs and Coil for "Lift" Contactor
4291-91819-002	59401-003	
4291-91805-202	59401-004	
4291-91806-202	59401-005	1 - Set of Contacts, Springs and Coils for "Drop" Contactor
4291-91807-106	59401-006	1 - Polarity Sensing Rectifier
		1 - Set of Contacts and Coil for Magnet Economizing Contactor, when applicable
		1 - Auxiliary Contact Assembly for "Drop" Contactor
		1 - Discharge Sensor Module (DSM)
		1 - Drop Relay (DR)



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