MMPB-440G

High-Intensity Magnetic Filter

…Only from Eriez.

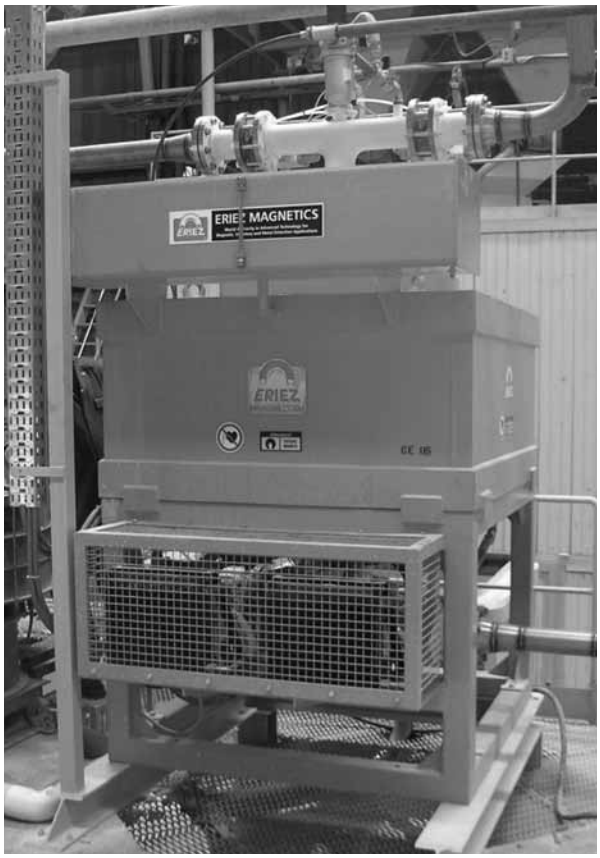
Matrix Models for Wet Applications

New, stronger magnetic separators remove fine ferrous and paramagnetic contaminants from flowing liquids.

The magnetic collection of fine particles requires a high-intensity, high-gradient magnetic field. An electromagnetic matrix-type separator, referred to as a magnet filter, has proven to be the most effective method of separation. This type of separator utilizes a high-intensity electromagnet and a flux-converging matrix. The matrix amplifies the magnetic field and provides high-gradient collection sites for the magnetic contaminants.

In recent years, sophisticated computer programs such as multidimensional finite element analysis have provided the optimization of these electromagnetic circuits. This has led to the design of electromagnetic matrix-type magnetic filters possessing very high magnetic gradients and resulting in an increase in the magnetic attractive force. A new line of magnetic filters has been designed to provide the optimum in magnetic collection and separation efficiency capturing even paramagnetic (feebly magnet) contaminants.

A line of permanent magnetic filters is also available.



ERIEZ®

FEATURES

- Easy cleaning
- Various sizes and magnetic field strengths
- Increased magnetic strength
- Electro and Permanent models
- Custom designs available

MAGNETIC FILTERS

The electromagnet filter consists of a solenoid coil encased in steel. The coil generates a uniform magnetic field throughout the bore. A stack of expanded metal discs (termed matrix) is packed in the bore of the coil and is induced by the magnetic field.
A typical matrix will consist of 20 to 40 medium-grid (1/4 inch [6mm), 18 gauge) expanded metal discs reaching the height of 6 inches (152 mm).
The matrix amplifies the background magnetic field, produces localized regions of extremely high gradient, and provides the collection sites for paramagnetic-particle capture. As feed material filters through the matrix, the paramagnetic particles are captured and consequently removed from the particle stream.

A schematic diagram of a wet electromagnetic filter is shown at right. The cutaway view shows the coil, matrix canister, and the matrix.
The matrix canister, as well as all other wetted surfaces, is 300-series stainless steel. The filters are rated at operating pressures of 15 and 150 psi (1 bar and 10 bar). The matrix is 400-series (magnetic) stainless steel. In wet separation, the fluid drag provides the separating force between the magnetic contaminants and the nonmagnetic medium. The slurry is fed to the filter at the top of the unit. Alternatively, the filter can be bottom fed. As the feed material filters through the matrix, the magnetic contaminants are captured while the non-magnetic medium passes through. When the magnetic contaminants eventually build up on the matrix, the separator is de-energized, and the matrix is flushed clean.

The filters are rated by the magnetic field strength generated in the bore of the solenoid coil with the matrix removed. This background magnetic field represents the driving force that produces the amplified high gradient throughout the matrix. Dependent on the matrix configuration, it is typically the case that a 2500-gauss background field will result in an excess of 10,000 gauss in localized regions of the matrix. Filters are available with background magnetic fields ranging up to 10,000 gauss.

GENERAL SPECIFICATIONS

Model	Magnetic Field Strength (Gauss)	Hydraulic Capacity (GPM)	Canister Diameter (Inches)	Inlet/Outlet Diameter (Inches)	Watts	Rectifier Model	Weight Pounds
10-15P	1,600	10	2 x 8	1-1/2	Permanent	—	100
25-15P	1,600	25	3 x 10	2	Permanent	—	200
50-15P	1,600	50	4 x 15	3	Permanent	—	270
10-15	1,500	10	3-1/2	2	1,000	10C	983
25-15	1,500	25	6	2	1,400	15C	1,297
50-15	1,500	50	8	2	1,600	20C	1,574
100-15	1,500	100	12	3	1,900	20C	2,160
200-15	1,500	200	16	3	2,100	25C	2,720
10-25	2,500	10	3-1/2	2	2,000	20C	2,811
25-25	2,500	25	6	2	2,500	25C	2,957
50-25	2,500	50	8	2	2,700	30C	3,341
100-25	2,500	100	12	3	3,300	35C	4,549
200-25	2,500	200	16	3	3,800	40C	5,512
10-50	5,000	10	3-1/2	2	4,500	50C	4,066
25-50	5,000	25	6	2	6,500	75C	6,158
50-50	5,000	50	8	2	6,500	75C	7,898
100-50	5,000	100	12	3	7,500	75C	8,816
200-50	5,000	200	16	3	8,500	10K	9,793

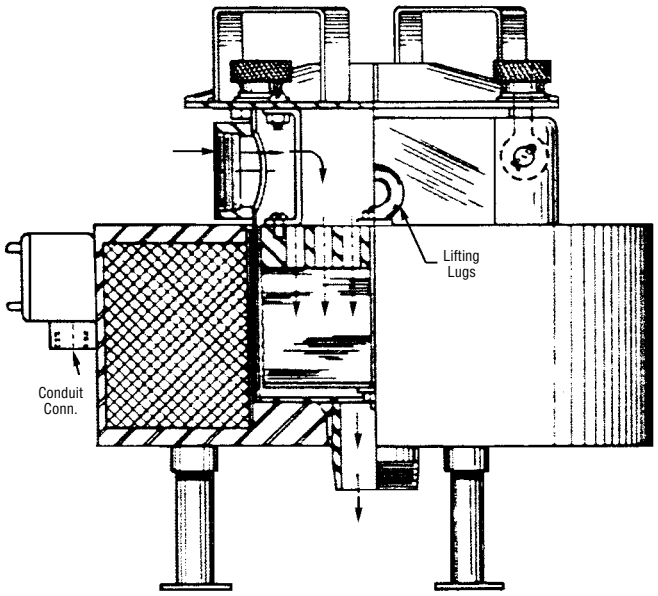


***Figure 1** - General schematic of 10-15, 25-15 and 50-15 model magnetic filters with convection cooling.*

The permanent magnetic filter is constructed with conventional-ferrite magnetic material. These magnets are attached to the filter housing requiring removal of the matrix for cleaning. A typical filter is shown in the schematic on the previous page.

A permanent magnetic filter is rated by its magnetic field strength in the open-air gap (between the poles). The field strength of these filters measures 1,600 gauss.

DETERMINING MAGNETIC FIELD REQUIREMENTS

The required background magnetic field for effective particle collection is typically determined through an identification of the magnetic contaminant or by quantitative testing. Some general guidelines for magnetic field requirements are as follows:

1,500 Gauss
Relatively coarse (+50 micron) ferromagnetic iron of abrasion in a medium not exceeding 1000 centipoise.

2,500 Gauss
Fine (-50 micron) ferromagnetic iron of abrasion or scale in a medium not exceeding 5000 centipoise.

5,000 Gauss
Very fine (sub-micron) ferromagnetic iron of abrasion or scale, or paramagnetic contaminants such as iron-bearing minerals or nickel and cobalt compounds.

10,000 Gauss
Fine paramagnetic contaminants. Often used to provide maximum product brightness or where product specifications call for ppm or ppb contaminant levels.

Note that low magnetic-field strengths adequate for the capture of ferrous contaminants can be generated with permanent magnets. Design capacities with the permanent filters are limited to 50 GPM (189 1/min) since the matrix is removed from the separator for cleaning.

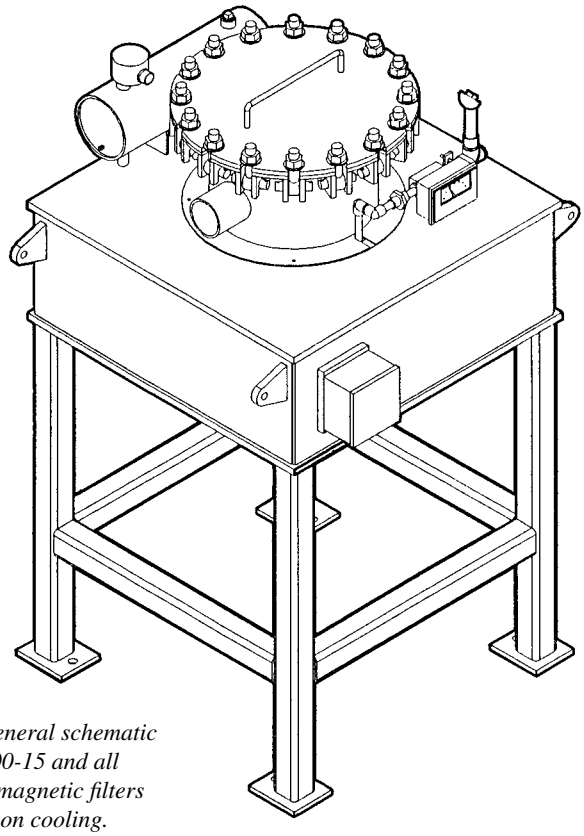


Figure 2 - General schematic of 100-15, 200-15 and all 2,500-gauss magnetic filters with convection cooling.

FLOW RATES AND CAPACITIES

Magnetic filters are available in a wide range of bore diameters. The hydraulic capacity of the filters ranges from 10 to 200 GPM corresponding to bore diameters from 3-1/2 to 16 inches. Duty cycles (operating time of the magnet between matrix flushing cycles) are typically determined by identifying the amount of magnetic material contained in the feed material. Materials containing up to one percent contaminant may require frequent matrix flushing. In these applications, the duty cycle may approximate 10 to 30 minutes. Treating relatively pure material, which may only average ppm levels of contamination, allows relatively long duty cycles. A filter treating a medium containing ppm iron contamination may only require matrix flushing every eight hours.

The electromagnetic coil is completely enclosed in a steel housing. The coil is submerged in oil to provide efficient heat dissipation. The 1500- and 2500- gauss magnetic filters are convection cooled. The 5000-gauss magnetic filters have a heat exchanger. The oil is circulated through the heat exchanger in a closed-loop circuit. The heat exchanger requires 10 GPM of cooling water.

The electromagnet operates on direct current. The direct current is provided by a power supply that uses full-wave bridge-silicon rectifiers. The electrical input to the power supply is 230/460 VAC, three phase, 60 cycle. The power supplies are protected with dual-element fuses and with current-limiting fuses designed specifically for the protection of the semiconductors.

Standard enclosures are NEMA 1 – open ventilated 14-gauge steel cabinets. NEMA 4 – water-tight, and NEMA 9 or NEMA 12 – dust-tight constructions are available as options.

An optional automated-backflush system is available for the necessary periodic cleaning of the matrix. The backflush system is a network of four electric-pneumatic valves to sequence the flushing operation. During the flushing operation, the feed is stopped, the magnet is de-energized, and water is flushed through the matrix, purging the magnetic material through a separate piping arrangement. The cleaning cycle times are variable and adjustable via a programmable controller.

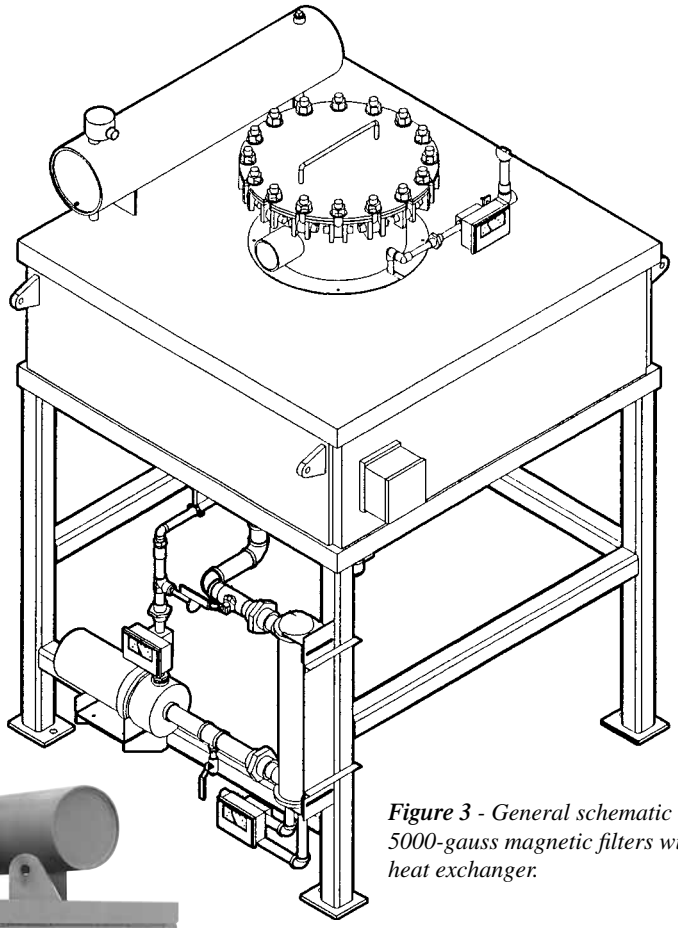


***Figure 3** - General schematic of 5000-gauss magnetic filters with heat exchanger.*

Dimensions and specifications are subject to change without notice.

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