DC EM LAB PUMPS

Lab-Scale Direct Current Electromagnetic Conduction Pumps

Creative Engineers, Inc.

CUSTOMER DRIVEN SOLUTIONS
New Freedom, PA | Greenville, SC
15425 Elm Drive, New Freedom PA 17349
(717) 235-5469
www.creativeengineers.com
info@creativeengineers.com

FEATURES & BENEFITS

1. Continuous operation at liquid metal temperatures up to 752°F/400°C. Higher temperatures are possible depending on the installation and design.
2. No moving parts + no seals + no packing glands = no leaks!
3. Flow control from 10 to 100 % of capacity with no throttling valves.
4. Low maintenance – reliable for 20+ years.
5. Operable in radiation fields.
6. Proven performance since 1950.
7. Small units – often fitting in less than 1 ft^3 of space.
8. No need to develop a specialized pump.

PRINCIPLE OF OPERATION

In a DC conduction electromagnetic pump, the liquid metal is the conductor of electricity. When current passes through the pump section (perpendicular to the magnetic field), a force is produced within the liquid metal that is at right angles to the current and magnetic field.

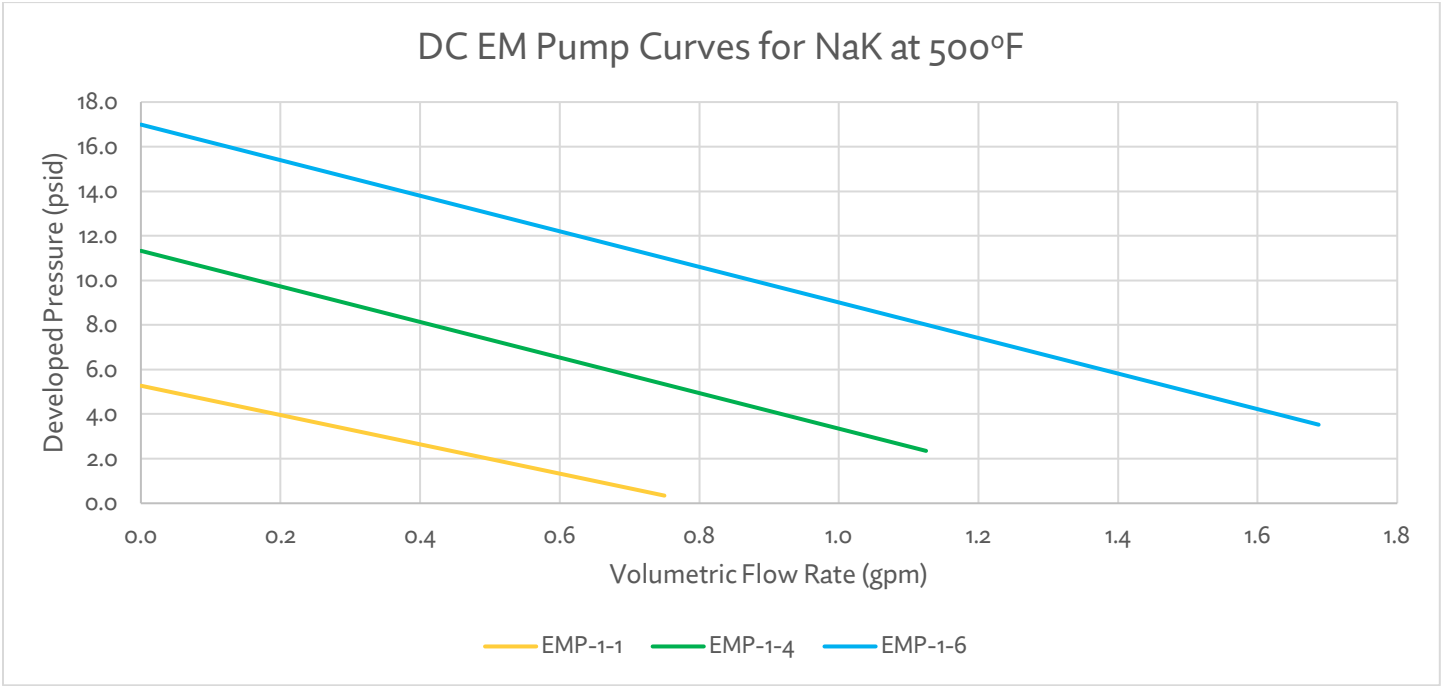
APPLICATIONS

The performance curves shown below were constructed for potassium-sodium alloy (NaK) at 500°F. CEI pumps can also be used with sodium, potassium, rubidium, lithium, cesium, a variety of alkali metal-containing alloys, and other liquid metals. Further data and more detailed pump design specific to individual applications can be provided upon request.

The pumps will operate at any point on or below the maximum curves. The pumps are pressure devices; with a fixed applied voltage flow will be established according to the pressure drop in the system external to the pump.

The performance of any given pump will vary somewhat with the type of fluid, temperature, and materials of construction. Effective pumping in a DC conduction EM pump requires that the liquid metal wet the pump tube. It is best to select a pump with a maximum performance curve above the expected normal operating point, or to specify required performance and details of the application so that CEI can recommend the appropriate pump.

EM Pump Specifications



EM Pump Style	DC Power Supply Input	DC Power Supply Output	Cage Dimensions (in)	Flow Tube OD (in)
EMP-1-1	208 VAC, 3-Phase	850 A, 0-5 VDC	7.75 x 8.5625 x 8.625	0.375
EMP-1-4			17.5 x 8.5625 x 8.625	
EMP-1-6			24 x 8.5625 x 8.625	

	EMP-1-1		EMP-1-4		EMP-1-6	
For NaK at 500°F	Flow Rate (gpm)	Pressure (psig)	Flow Rate (gpm)	Pressure (psig)	Flow Rate (gpm)	Pressure (psig)
Deadhead Pressure	0.0	5.3	0.0	11.3	0.0	17.0
Max Flow Rate	0.8	0.3	1.1	2.4	1.7	3.5

POWER SUPPLY REQUIREMENTS

Our standard pumps require an electrical supply of 240 Volts AC, single phase, 60 Hertz to a DC rectifier. Maximum power draw for any of CEI's standard DC EM induction pumps is 850 amps.

PUMP PLACEMENT CONCERNS

Important factors which determine where the pump should be placed in a system are below:

1. The pump must be positioned such that it will be flooded before and during operation to prevent the high secondary armature current from overheating the pump tube. An inlet pressure at the suction end of the pump of a least two feet of liquid metal above the vapor pressure should be maintained.
2. Piping stress due to thermal expansion and contraction of the system must not place a strain on the pump in such a manner as to rupture or cause permanent distortion of the pumping section. The pump is modeled in the run as a straight piece of tube with one vertical hanger at the pump frame support.
3. The maximum rated operating temperature of the pump must not be exceeded. Ambient temperature should be maintained below 150 °F. An open construction is used on the pump to permit natural circulation of air for cooling.

All CEI DC conduction EM pumps are supplied with special tubular electrical heating elements for preheating purposes when pumping a material which is solid at room temperature. The heater should be used only for preheating and should be turned off when the pump is operating.

If the cover gas or liquid metal vapor is trapped in the pumping section, pumping will stop immediately; and the secondary current will cause rapid heating of the pump tube. To prevent damage, a relay should be provided which will shut off power to the pump when the flow drops

INSTALLATION

Pump installation is quite simple, whether it is to be used in a continuous loop or in an open system. The pump is supplied with tube ends for connecting to tubing or piping systems. An eye hook or hanger is provided from which the pump can be hung. The pumps are too heavy to be supported by the connecting tubing or piping. The pumps can be supported from the bottom; however, provisions must be made to maintain air circulation through the pump cage.

TESTING AND CALIBRATION

CEI has developed a dedicated and proprietary system for the testing and calibration of a variety of alkali-metal-containing equipment (see photo to the right).

ABOUT US

Creative Engineers, Inc. (CEI) is a unique and innovative alkali metal engineering company with the capability to design, build, and operate research and pilot-scale systems to meet customer needs. Each of our alkali metal expert engineers has from 5 to 30 years of experience.

The rapid results obtainable from CEI's dedicated resources often accelerate project schedules as opposed to performing the work in-house, where the researcher's efforts are often allocated among multiple projects.

We also work with other liquid metals, such as lead, antimony, bismuth, etc. and their alloys.

Contact us today at (717) 235-5469 to find out more information about our alkali metal experience.

Electromagnetic DC Lab Pumps (or DC EM Pumps) are specifically designed for use with liquid metals at temperatures up to 752°F (400°C) and flow rates < 2 gpm.

They have no moving parts and no seals and are therefore ideal for use with molten metals – including alkali metals such as NaK, sodium, and lithium.

For information on larger EM pumps, please refer to our AC EM Pumps and FLIP pump brochures.

Creative Engineers, Inc.

CUSTOMER DRIVEN SOLUTIONS

New Freedom, PA | Greenville, SC
15425 Elm Drive, New Freedom PA 17349
(717) 235-5469
www.creativeengineers.com
info@creativeengineers.com